



Antonio Vinci

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Indirizzo: Istituto di Scienza, Tecnologia e Sostenibilità per lo Sviluppo dei Materiali Ceramici - CNR, Via Granarolo, 64, 48018, Faenza, Italia (Lavoro)

● ESPERIENZA LAVORATIVA

BORSISTA DI RICERCA (PROT. 0097289/2026) – ISTITUTO DI SCIENZA, TECNOLOGIA E SOSTENIBILITÀ DEI MATERIALI CERAMICI - ISSMC - CNR – 02/03/2026 – Attuale – FAENZA, ITALIA

Progetto: DANDELION (3D nANostructureD MEA for evaLUatIng astrocyte-neurON interactions in 3D co-cultures)

Progettazione e produzione di materiali ceramici e a base di fibra per la produzione di matrici di elettrodi nanostrutturati. Funzionalizzazione di fibre di carbonio e carburo di silicio. Caratterizzazione della microstruttura, proprietà meccaniche e misure elettriche.

RICERCATORE DI III LIVELLO A TEMPO DETERMINATO (PROT. 0219193/2023, RINNOVO PROT. 0246225/2025) – ISTITUTO DI SCIENZA, TECNOLOGIA E SOSTENIBILITÀ DEI MATERIALI CERAMICI - ISSMC - CNR – 17/07/2023 – 28/02/2026 – FAENZA, ITALIA

Durata: 958 giorni (31 mesi) al 28/02/2026

Progetto: EcoSister (Ecosystem for Sustainable Transition in Emilia-Romagna)

Progettazione e design di un processo di produzione di materiali ceramici fibro-rinforzati con materie prime seconde o da riciclo per l'ottenimento di compositi ceramici sostenibili per la transizione ecologica. Caratterizzazione microstrutturale dei materiali ceramici e delle fibre, studio delle proprietà meccaniche e di resistenza all'ossidazione e confronto con materiali ottenuti da materie prime commerciali.

ASSEGNISTA DI RICERCA SENIOR (PROT. 0002202/2021, RINNOVO PROT. 2265/2022) – ISTITUTO DI SCIENZA, TECNOLOGIA E SOSTENIBILITÀ DEI MATERIALI CERAMICI - ISSMC - CNR (GIÀ ISTEK) – 22/11/2021 – 16/07/2023 – FAENZA, ITALIA

Durata: 602 giorni (20 mesi)

Progetto: CARBOSPACE (Studio sui compositi ultra-refrattari a base di matrici ceramiche UHTC e fibre di C o SiC per applicazioni in aerospazio, difesa, trasporti ed energia)

Progettazione e produzione di materiali compositi fibrorinforzati per l'applicazione dell'aerospazio, difesa e trasporti, mediante processo basato sulla slurry infiltration e sintering con Hot Pressing. Caratterizzazione della microstruttura, proprietà meccaniche e resistenza all'ossidazione, ablazione e usura.

ASSEGNISTA DI RICERCA POST-DOC (PROT. 0002358/2020) – ISTITUTO DI SCIENZA, TECNOLOGIA E SOSTENIBILITÀ DEI MATERIALI CERAMICI - ISSMC - CNR (GIÀ ISTEK) – 10/11/2020 – 09/11/2021 – FAENZA, ITALIA

Durata: 365 giorni (12 mesi)

Progetto: InSPiRE (Integrated technologies for Smart buildings and PREdictive maintenance)

Trattamento polveri e produzione di compositi ceramici, caratterizzazione microstrutturale e chimico-fisica di materiali ceramici e studi sulla corrosione.

ASSEGNISTA DI RICERCA (PROT. 0002259/2018, RINNOVO PROT. 0002224/2019) – ISTITUTO DI SCIENZA E TECNOLOGIA DEI MATERIALI CERAMICI - ISTEK - CNR – 05/11/2018 – 04/11/2020 – FAENZA, ITALIA

Durata: 731 giorni (24 mesi)

Progetto: C³HARME (Next Generation Ceramic Composites For Combustion Harsh Environments And Space)

Progettazione e design di compositi ceramici fibrorinforzati per l'aerospazio mediante slurry infiltration e sintering con Hot Pressing o Spark Plasma Sintering. Caratterizzazione microstrutturale e meccanica dei compositi ceramici, e studio del comportamento in ossidazione e ablazione. Messa a punto di un nuovo processo di produzione basato sulla Reactive Melt Infiltration.

VISITING SCIENTIST – DEUTSCHES ZENTRUM FÜR LUFT- UND RAUMFAHRT - DLR – 15/06/2023 – 15/08/2023 – KÖLN, GERMANIA

Deposizione di coating a base di Niobio metallico su compositi ceramici fibro-rinforzati a matrice ultra-refrattaria. Ricottura ad alta temperatura e studio dei fenomeni di adesione ed interazione all'interfaccia tra il substrato e il coating. Studio del comportamento in ossidazione sui compositi con e senza coating e studio sull'influenza della ricottura sulla resistenza all'ossidazione.

VISITING SCIENTIST – AIRBUS AEROSPACE & DEFENCE – 07/10/2019 – 11/10/2019 – OTTOBRUNN, GERMANIA

Filament winding di compositi ceramici fibro-rinforzati con matrice ultra-refrattaria, preparazione delle sospensioni ceramiche, design degli esperimenti e supervisione della macchina per Filament Winding. Da questa ricerca sono stati prodotti due articoli su riviste peer review sul filament winding dei compositi ultrarefrattari e sul loro scale up.

VISITING SCIENTIST – DEUTSCHES ZENTRUM FÜR LUFT- UND RAUMFAHRT - DLR – 18/06/2018 – 28/07/2018 – STUTTGART, GERMANIA

Progettazione di materiali ceramici ottenuti mediante infiltrazione con polimero e pirolisi di preforme a base di fibra di carbonio, precedentemente infiltrate con polveri ultra-refrattarie mediante slurry infiltration, seguite da reactive melt infiltration con silicio o zirconio liquido e design degli esperimenti. Assemblaggio di una camera di zirconia speciale per svolgere test di ossidazione a 2000 - 2200°C a diverse pressioni. Da questa attività di ricerca, sono stati pubblicati due articoli su riviste peer review sul reactive melt infiltration con Zr₂Cu e sull'influenza della pressione sulla resistenza all'ossidazione dei compositi ultra-refrattari.

VISITING SCIENTIST – MISSOURI UNIVERSITY OF SCIENCE AND TECHNOLOGY - MS&T – 20/07/2017 – 16/09/2017 – ROLLA (MO), STATI UNITI

Caratterizzazione meccanica ad alta temperatura di compositi ultra-refrattari, fibro-rinforzati, con matrice a base di ZrC, TaC e HfC, da temperatura ambiente a 2100°C in ambiente inerte. Programmazione e taglio di precisione mediante EDM di campioni ceramici. Studio della diffusività termica mediante Laser Flash. Studio della resistività elettrica dei compositi ceramici. Da questa ricerca sono stati pubblicati due articoli su riviste peer review sul comportamento termo-meccanico di compositi a base di TaC e ZrC fino a 2100°C, e sull'influenza del contenuto di fibra sulla resistenza meccanica di compositi a base di HfC fino a 2100°C.

VISITING SCIENTIST – AIRBUS AEROSPACE & DEFENCE – 22/03/2017 – 24/03/2017 – OTTOBRUNN, GERMANIA

Filament winding di compositi ceramici fibro-rinforzati con matrice ultra-refrattaria, preparazione delle sospensioni ceramiche, design degli esperimenti e supervisione della macchina per Filament Winding. Sulla base dei risultati di questa ricerca, è stato successivamente sviluppato lo scale-up di questi materiali.

● ISTRUZIONE E FORMAZIONE

17/03/2025 – ATTUALE

ABILITAZIONE SCIENTIFICA NAZIONALE Ministero dell'Università e della Ricerca

Campo di studio Settore Concorsuale 09/D1 - Scienza e Tecnologia dei Materiali

01/11/2015 – 15/03/2019 Parma, Italia

DOTTORATO DI RICERCA IN SCIENZA E TECNOLOGIA DEI MATERIALI Università di Parma (Associata con l'Istituto di Scienza e Tecnologia dei Ceramici - ISTECCNR)

Trattamento polveri tramite macinazione a secco e ad umido, studi di reologia sulle sospensioni ceramiche, preparazione di slurry a base acquosa, sviluppo di un processo di slurry infiltration per preforme in fibra di carbonio di

diverso modulo, sinterizzazione di compositi ceramici tramite pressatura a caldo, caratterizzazione della microstruttura e della composizione tramite SEM/EDS/XRD, caratterizzazione meccanica (resistenza a flessione, tenacità a frattura) da temperatura ambiente fino a 2100°C in impianti dedicati, studio del comportamento all'ossidazione da temperatura ambiente fino a 2200°C, studio delle proprietà termiche, scale up del processo (da $\varnothing = 30$ mm a 400 mm, da h = 2 mm a 150 mm), preparazione di prototipi per test in ambiente rilevante (TRL = 5/6)

Indirizzo Parco Area delle Scienze, 11/a, 43124, Parma, Italia | **Sito Internet** <https://scvsa.unipr.it/it> | **Voto finale** Excellent |

Livello EQF Livello 8 EQF | **Classificazione nazionale** Doctorate |

Tesi Fabrication and characterization of fibre reinforced UHTC composites

31/10/2013 – 16/10/2015 Bologna, Italia

LAUREA MAGISTRALE IN CHIMICA INDUSTRIALE Università di Bologna

Preparazione di catalizzatori per la reazione di Water Gas Shift basati sulla fase tipo idrotalcite CuAl_2O_4 , ottenuta per coprecipitazione di nitrati e cloruri dei metalli con una soluzione di carbonato, e impregnati con indio e gallio metallici. Determinazione della temperatura di attivazione mediante riduzione in programmata di temperatura, assemblaggio di un reattore in scala di laboratorio che operava tra 1-20 bar, misura dell'attività catalitica mediante analisi gas cromatografica dei flussi gassosi in entrata e uscita dal reattore, determinazione della formazione di alcol mediante HPLC.

Indirizzo Viale del Risorgimento 4, 40136, Bologna, Italia | **Sito Internet** <https://chimica-industriale.unibo.it/it> |

Voto finale 103/110 | **Livello EQF** Livello 7 EQF | **Classificazione nazionale** Master Degree | **Numero di crediti** 180 |

Tesi Catalizzatori per la reazione di Water Gas Shift a media ed alta temperatura

31/10/2010 – 29/11/2013 Catania, Italia

LAUREA TRIENNALE IN CHIMICA INDUSTRIALE Università di Catania

Preparazione di catalizzatori per l'idrolisi di NaBH_4 per l'applicazione in celle a combustibile a base di Co e Ru metallici supportati su TiO_2 mediante impregnazione e calcinazione. Valutazione della temperatura di attivazione tramite riduzione in programmata di temperatura con H_2 . Misura dell'attività del catalizzatore misurando il flusso di H_2 sviluppato dalla reazione con una soluzione di NaBH_4 . Correlazione dell'attività del catalizzatore con la struttura e la morfologia del materiale.

Indirizzo Piazza Università, 2, 95131, Catania, Italia | **Sito Internet** <https://www.dsc.unict.it/> | **Voto finale** 110/110 con lode |

Livello EQF Livello 6 EQF | **Classificazione nazionale** Bachelor Degree |

Tesi Catalizzatori a base di rutenio e cobalto supportati su titania per la produzione di idrogeno mediante idrolisi catalitica di NaBH_4

● PROGETTI

01/03/2026 – ATTUALE

DANDELION (3D nANostructured MEA for evaluating astrocytenuRON interactions in 3D co-cultures)

Progetto finanziato da Air Force Office of Scientific Research, in collaborazione con il dott. Luca Zoli.

Ruolo:

Attività di ricerca su materiali ceramici avanzati e loro processi di fabbricazione, includendo:

- preparazione di polveri ceramiche (carburi, boruri, nitruri e ossidi) mediante miscelazione a secco e in umido
- lavorazione e modifica di fibre ceramiche
- produzione di compositi ceramici mediante slurry infiltration e consolidamento tramite hot pressing e Spark Plasma Sintering (SPS)
- caratterizzazione microstrutturale e composizionale (SEM/EDS, XRD)
- caratterizzazione meccanica (resistenza a flessione, tenacità a frattura, durezza)
- studio delle proprietà elettriche dei materiali

17/07/2023 – 28/02/2026

ECOSISTER (Ecosistema Territoriale di Innovazione dell'Emilia-Romagna)

Progetto PNRR (ECS00000033) Missione 4, Componente 2, Investimento 1.5, "ECOSISTER"

Ruolo:

Sviluppo e ottimizzazione di compositi ceramici avanzati e sostenibili:

- preparazione di polveri ceramiche (carburi e boruri) e sospensioni ceramiche
- infiltrazione di preforme fibrose con matrici ceramiche mediante slurry infiltration

- utilizzo di fibre riciclate per compositi strutturali
- consolidamento tramite hot pressing e SPS
- caratterizzazione microstrutturale e composizionale (SEM/EDS, XRD)
- caratterizzazione meccanica (flessione, tenacità a frattura, durezza)
- studio del comportamento all'ossidazione e ablazione (>1600 °C)
- ottimizzazione di compositi ceramici leggeri

Link <https://ecosister.it/>

18/07/2022

INFINITE (Liquid phase sintering of C fiber reinforced ultra-high temperature ceramics composites) (Prot. 0001423/2022)

Progetto n° W911NF2110333 finanziato da U.S. Army Contracting Command , coordinato dal dott. Luca Zoli.

Ruolo:

- macinazione e miscelazione di polveri a secco e umido
- preparazione di sospensioni acquose ceramiche
- produzione di compositi ceramici mediante slurry infiltration e consolidamento tramite hot pressing e Spark Plasma Sintering (SPS)
- studio delle interfacce a temperatura elevata
- caratterizzazione microstrutturale (SEM/EDS, XRD)
- caratterizzazione meccanica (flessione, tenacità a frattura)
- studio del comportamento all'ossidazione

12/05/2020 – ATTUALE

CARBOSPACE (Studio sui compositi ultra-refrattari a base di matrici ceramiche UHTC e fibre di carbonio o carburo di silicio per applicazioni in aerospazio, difesa, trasporti ed energia) (Prot. 0001420/2022)

Progetto su compositi ultra-refrattari per applicazioni aerospaziali, difesa, trasporti ed energia, coordinato dalla dott.ssa Diletta Sciti

Ruolo:

- sintesi e preparazione di polveri ceramiche (carburi, boruri, nitruri, ossidi)
- sviluppo di sospensioni ceramiche e processi di infiltrazione di preforme fibrose
- realizzazione di strutture graded (gradiente di matrice e contenuto di fibra)
- consolidamento tramite hot pressing e SPS
- fabbricazione di compositi porosi e densi
- caratterizzazione microstrutturale e composizionale (SEM/EDS, XRD)
- caratterizzazione meccanica (flessione, tenacità, durezza)
- studio di ossidazione e ablazione (>1600 °C)
- studio delle proprietà elettriche

Link <https://www.cnr.it/it/progetti-di-ricerca/progetto/39934/carbospace-compositi-ultra-refrattari-per-aerospazio-difesa-trasporti-energia-dcm-ad006-251>

30/10/2020 – ATTUALE

Am3aC2a (Multi-scale approach for modelling CMC and UHTCMC materials, Development of models for damage and failure of carboceramics components) (Prot. 0001421/2022)

Progetto finanziato da Agenzia Spaziale Italiana, coordinato dal prof. Alessandro Airoidi, in collaborazione con la dott.ssa Diletta Sciti

Ruolo:

- preparazione di sospensioni ceramiche mediante wet ball milling
- supporto alla progettazione di processi di fabbricazione di compositi su scala industriale
- infiltrazione di slurry e consolidamento tramite hot pressing
- caratterizzazione microstrutturale (SEM/EDS, XRD)
- caratterizzazione meccanica (flessione, tenacità a frattura)

Link <https://www.cnr.it/it/progetti-di-ricerca/progetto/42478>

01/06/2016 – 31/05/2020

C3HARME (Next Generation Ceramic Composites For Combustion Harsh Environments And Space) (Prot. 0002545/2018, 0000155/2021)

Progetto europeo H2020 n°685594 "C3HARME" su compositi ceramici per ambienti estremi, coordinato dalla dott.ssa Diletta Sciti

Ruolo:

- lavorazione di polveri ceramiche tramite macinazione a secco e umido
- studio reologico di sospensioni ceramiche
- sviluppo di processi di infiltrazione di preforme in fibra di carbonio
- consolidamento mediante hot pressing
- caratterizzazione microstrutturale (SEM/EDS, XRD)
- caratterizzazione meccanica (flessione, tenacità) fino a 2100 °C
- studio dell'ossidazione fino a 2200 °C
- caratterizzazione termica
- scale-up di processo (da provini Ø30 mm a 400 mm; spessori da 2 a 150 mm)
- produzione di dimostratori tecnologici (TRL 5-6)

Link <https://c3harme.eu/>

ONORIFICENZE E RICONOSCIMENTI

14/04/2024

Migliore presentazione orale a conferenza ECI 2024 - J ECS Trust

Premiazione per la migliore presentazione orale a "Ultra-High Temperature Ceramics: Materials for Extreme Environment Applications VI" a Giardini Naxos 2024 e vincitore di un premio finanziato dal J ECS Trust. **Fondi:** 500€

15/06/2023

Grant per attività di ricerca presso German Aerospace Center (DLR) - J ECS Trust

Vincitore di un grant finanziato dal J ECS Trust per lo svolgimento di attività di ricerca presso il Deutsches Zentrum für Luft- und Raumfahrt (DLR) di Köln (Germania) sulla deposizione di coating a base di Nb su UHTCMC. N° Contratto 2023341. **Fondi:** 4500 €

22/09/2019

Grant per partecipazione a conferenza HT-CMC19 - J ECS Trust

Vincitore di un grant finanziato dal J ECS Trust per la partecipazione alla "10th International Conference on High Temperature Ceramic Matrix Composites" a Bordeaux (Francia). **Fondi:** 500 €

27/11/2018

2° migliore presentazione orale & Grant per partecipazione a conferenza ECERS19 - J ECS Trust

Premiazione per la 2° migliore presentazione orale al "Workshop for Young Ceramists" a Bologna 2018, e vincitore di un grant finanziato dal J ECS Trust per la partecipazione alla "European Ceramic Society conference" a Torino (Italia). **Fondi:** 750€

27/01/2019

Grant per partecipazione a conferenza e workshop ICACC19 - J ECS Trust

Vincitore di un grant finanziato dal J ECS Trust per la partecipazione al "Winter Workshop" e alla "International Conference of the American Ceramic Society" a Daytona Beach (Florida). N° Contratto 2016124-23. **Fondi:** 1200 €

21/01/2018

Grant per partecipazione a conferenza e workshop ICACC18 - J ECS Trust

Vincitore di un grant finanziato dal J ECS Trust per la partecipazione al "Winter Workshop" e alla "International Conference of the American Ceramic Society" a Daytona Beach (Florida). N° Contratto 2016124-10. **Fondi:** 1200 €

21/01/2018

Grant per partecipazione a conferenza e workshop ICACC18 - American Ceramic Division

Vincitore di un grant finanziato dall'American Ceramic Division per la partecipazione alla "International Conference of the American Ceramic Society" a Daytona Beach (Florida). **Fondi:** 175 \$

17/09/2017

Grant per partecipazione a conferenza ECI - J ECS Trust

Vincitore di un grant finanziato dal J ECS Trust per la partecipazione alla "Engineering Conference International: Ultra-high temperature ceramics - Materials for extreme environment applications IV" a Windsor (UK). **Fondi:** 500 €

25/04/2017

Grant per attività di ricerca a MS&T – J ECS Trust

Vincitore di un grant finanziato dal J ECS Trust per lo svolgimento di attività di ricerca presso il “Missouri University of Science & Technology” di Rolla (MO), sulla caratterizzazione termo-meccanica di UHTCMCs con matrice a base di carburi. **Fondi:** 2800 €

28/09/2016

Grant per partecipazione a workshop WGCC – J ECS Trust

Vincitore di un grant finanziato dal J ECS Trust per la partecipazione al “Workshop on Graphene/Ceramic Composites”, a Cuenca (Spagna). **Fondi:** 150 €

● PUBBLICAZIONI

[Lista delle pubblicazioni in riviste peer review \(*corresponding author\)](#)

N° pubblicazioni: 51 (42 articoli in riviste peer review, 1 capitolo di libro, 7 conference proceedings, 1 brevetto)

N° citazioni: 1476 (Scopus 20/05/2026)

H-index: 24 (Scopus 20/05/2026)

Link <https://www.scopus.com/authid/detail.uri?authorId=57194103976>

2026

Influence of different liquid phase sintering aids on the oxidation resistance of UHTCMCs with a ZrB₂ matrix

This study investigates the oxidation behaviour of carbon fibre-reinforced ZrB₂-SiC composites produced with different liquid phase sintering (LPS) aids and tested in air at 1650 °C. While all additives reduced the sintering temperature, Y₂O₃ negatively affected the formation of a protective borosilicate layer, accelerating oxidation and degradation. Among the investigated additives, ZrSi₂ provided the best balance between densification and oxidation resistance. **Role:** Preparation of the ceramic suspensions, fabrication of the composites via slurry infiltration and hot pressing, microstructure analysis, kinetics and thermodynamic analysis, writing and review editing.

M. Mor, A. Vinci*, D. Sciti, L. Zoli, Journal of the European Ceramic Society, 2026, accepted

2026

[Densification, thermodynamics and interfaces of liquid phase sintered carbon fibres reinforced ZrB₂/SiC composites](#)

This study investigated liquid-phase sintering of ZrB₂/SiC-Cf UHTCMCs using ZrSi₂, Y₂O₃, and Si₃N₄ additives to reduce densification temperature to 1500–1700 °C. ZrSi₂ enabled the highest density (~83%), while thermodynamic analyses clarified fibre/matrix interfacial reactions through the concept of local chemistry. Mechanical performance strongly depended on the additive: Y₂O₃ achieved the highest fracture toughness (~12 MPa·m^{0.5}), whereas ZrSi₂ provided the highest flexural strength (250 MPa at room temperature and 370 MPa at 1500 °C). **Role:** Preparation of the ceramic suspensions, fabrication of the composites via slurry infiltration and hot pressing, microstructure analysis, mechanical testing, writing and review editing.

D. Sciti, A. Vinci*, B. Zanardi, M. Mor, S. Failla, L. Zoli, Composites part A, 206, 109765, 2026

2026

[Tribological studies of carbon fiber reinforced zirconium diboride based UHTCMC-material paired with carbon disk material](#)

The behavior of ZrB₂-10 vol% SiC ultra-high temperature ceramic matrix composites (UHTCMCs) reinforced with pitch-based carbon fibers (CF) for self-lubricated braking against a C/C disk was investigated, revealing C/C-specific two-regime friction behavior. Long and short carbon fibres were used as reinforcement. Tests revealed a pronounced reversible COF drop, driven by carbon decomposition at ≈470 °C. Both samples showed sufficient thermal shock resistance for braking applications up to 1000 °C.

Role: preparation of the ceramic suspensions, fabrication of the composites via slurry infiltration and hot pressing, review editing.

2026

[Enhanced oxidation resistance at 1700 °C of Cf-ZrB₂/SiC composites via NbB₂/NbC layered coatings](#)

Carbon fibre-reinforced ZrB₂/SiC composites were coated with ~13 µm niobium via magnetron sputtering and vacuum annealed at 1800 °C, forming a layered NbC-NbB₂ coating. Oxidation tests at 1500 °C and 1700 °C showed that the Nb-based coating stabilizes B₂O₃ at high temperature, significantly slowing oxidation of the ZrB₂/SiC matrix and carbon fibres.

Role: preparation of the ceramic suspensions, fabrication of the composites via slurry infiltration and hot pressing, microstructure analysis, oxidation testing, writing of the original draft and review editing.

A. Vinci*, J. Erik Foerster, R. Naraparaju, D. Sciti, Corrosion Science 206, 113521, 2026

2025

[Effect of WC addition on the mechanical properties and oxidation resistance of ZrB₂/SiC-based UHTCMCs](#)

The sintering behavior, mechanical properties, and oxidation resistance of Cf/ZrB₂-SiC-WC composites were investigated after hot pressing between 1800 and 2000°C. Processing at 1900°C provided the best compromise between densification (~92%) and fiber preservation, resulting in improved mechanical properties. WC promoted the formation of a more compact oxide scale during oxidation at 1650°C in air, enhancing oxidation resistance compared to reference ZrB₂-SiC composites.

Role: fabrication and testing of the ceramic composites, microstructure, mechanical and oxidation resistance characterization, writing and review editing

A. Vinci, M. Mor, L. Zoli, D. Sciti, International Journal of Applied Ceramic Technology 22(6), 70031, 2025

2025

[Novel CMCs based on B₄C-TiB₂ blends and carbon fibres](#)

Lightweight Cf/B₄C-TiB₂ composites with varying B₄C contents and fiber gradients were produced via slurry infiltration and sintering. The B₄C/TiB₂ ratio strongly affected the fiber/matrix interfacial strength and fracture behavior, with 75% B₄C providing higher fracture toughness due to a weaker interface. To overcome the hardness reduction caused by carbon fibers, a graded composite architecture was developed, combining a tough fiber-rich inner layer with a harder outer layer reaching ~27 GPa hardness.

Role: fabrication of the ceramic composites, thermodynamic calculations, microstructural characterization, writing and review editing

A. Vinci, M. Mor, S. Failla, P. Galizia, L. Zoli, D. Sciti, Journal of the European Ceramic Society, 2025, 45(10), 117355

2024

[Dry tribological behavior of 0/90° continuous carbon fiber reinforced ZrB₂ based UHTC-material](#)

The tribological behavior of Cf/ZrB₂-SiC UHTCMCs was investigated under braking conditions against steel and C/C-SiC disks using a custom dynamometer. Stable friction coefficients were obtained under different contact pressures, with values ranging from 0.40 to 0.86 depending on pressure and counterface material. Post-test surface analyses revealed the formation of distinct friction films composed of pad material alone or mixed pad/disk material.

Role: fabrication of the ceramic composites, microstructural characterization, writing and review editing

M. Mor, M. Meiser, N. Langhof, A. Vinci, L. Zoli, B. Laukant, S. Tremmel, S. Schafföner, D. Sciti, Journal of the European Ceramic Society, 2024, 44(14), 116664

2024

[A bi-phasic numerical approach for non-linear response and stiffness recovery related to residual thermal stress in UHTCMCs](#)

A simplified analytical model was developed to predict the behaviour of residual thermal stresses on ZrB₂-based UHTCMCs. Tensile tests were carried out on different laminating sequences, and the model's efficacy in capturing the non-linear response of the unidirectional and cross ply lay-ups was demonstrated.

Role: fabrication of the ceramic composites, microstructural characterization, writing and review editing

2024

[Processing and oxidation resistance at 1650°C of ZrB₂-based UHTCMCs with short fibre gradients](#)

IF: 6.2

Functionally graded composites with fibre gradients were prepared and characterized at 1650°C in air. Three different compositions (ZrB₂-SiC-Y₂O₃, ZrB₂-MoSi₂, SiC-Y₂O₃), The composite layers were perfectly joined at the interface with no visible defects and no spallation phenomena were observed following oxidation. ZrB₂-MoSi₂ emerged as the most effective composition thanks to the formation of a compact ZrO₂-SiO₂ scale.

Role: microstructural characterization, thermodynamic simulations, writing and review editing

M. Mor, A. Vinci, D. Sciti, Journal of the European Ceramic Society, 2024, 44(7), pp. 4536-4548

[Elevated temperature performance: Arc-jet testing of carbon fiber reinforced ZrB₂ bars up to 2200 °C for strength retention assessment](#)

Cf/ZrB₂-SiC UHTCMCs were tested inside an arc-jet facility up to 2200 °C and subsequently evaluated under 3-point bending to investigate strength retention after oxidation damage. More than 75% of the initial strength was retained after repeated testing, demonstrating excellent durability and reusability. Oxide layer formation and strength degradation were correlated through volatility diagrams and numerical modeling, showing that strength reduction was mainly caused by oxidation-induced cross-section loss.

Role: fabrication of the ceramic composites, oxidation testing, thermodynamic calculations, microstructural characterization, writing and review editing

D. Sciti, A. Vinci*, L. Zoli, P. Galizia, M. Mor, W. Fahrenholtz, S. Mungiguerra, R. Savino, A.M. Caporale, A. Airoidi, Journal of Advanced Ceramics, 2025, 14, 9221022

2024

[ZrB₂-SiC ceramics toughened with oriented paper-derived graphite for a sustainable approach](#)

UHTCMCs reinforced with paper-derived graphite were produced and mechanically characterized. The values of strength and fracture toughness obtained were comparable to those of short carbon fibre reinforced composites, showing how cheaper carbon sources can be used for the reinforcement of such material.

Role: fabrication of the ceramic composite, microstructural characterization, writing and review editing

L. Zoli, F. Servadei, S. Failla, M. Mor, A. Vinci, P. Galizia, D. Sciti, Journal of Advanced Ceramics, 2024, 13(2), pp. 207-219

2024

[From outer space to inside the body: Ultra-high temperature ceramic matrix composites for biomedical applications](#)

UHTCMCs, originally designed for the application in extreme environments, have been considered for the use as biomaterials due to their excellent mechanical properties coupled with chemical inertness. A preliminary biological in vitro study demonstrated materials' lack of cytotoxicity, making them promising candidates for further investigation for biomedical purposes.

Role: preparation of the ceramic composites, microstructural characterization, writing and review editing

L. Zoli, F. Servadei, G. Bassi, A. Rossi, M. Montesi, A. Vinci, D. Sciti, S. Panseri, Journal of the European Ceramic Society, 2024, 44(2), pp. 729-737

2023

[Tribological behavior of carbon fiber reinforced ZrB₂ based ultra high temperature ceramics](#)

The tribological behaviour of ultra-high temperature ceramic matrix composites (UHTCMCs) was investigated. The high values of coefficient of friction obtained (0.5–0.7), their stability during the braking and the low wear rate make these materials appealing for automotive brake applications.

Role: preparation of reference specimens, microstructural characterization, supervision of the research activity, writing and review editing

M. Mor, M. Meiser, N. Langhof, A. Vinci, S. Failla, B. Laukant, S. Tremmel, S. Schaffoener, D. Sciti, Journal of the European Ceramic Society, 2023, 43(13), pp. 5413–5424

2023

[Propulsion tests on ultra-high-temperature ceramic matrix composites for reusable rocket nozzles](#)

Three nozzle prototypes, obtained by sintering, were tested 2–3 times in a hybrid rocket motor for proving reusability. These tests demonstrated the capability of complex-shaped prototypes made of UHTCMCs to survive repeated exposure to environments representative of a realistic space propulsion application without any failure nor measurable erosion.

Role: fabrication of the fibre reinforced UHTC composites, microstructural characterization, writing of the paragraphs on processing, microstructure, oxidation resistance, review editing

D. Sciti, A. Vinci*, L. Zoli, P. Galizia, S. Failla, S. Mungiguerra, G. D. Di Martino, A. Cecere, R. Savino, Journal of Advanced Ceramics, 2023, 12(7): 1345-1360

2023

[Melt/solid interaction and melt super-saturation effect on the microstructure asset of ultra-refractory composites prepared by reactive melting infiltration](#)

The reactions occurring between a Zr_2Cu melting phase and ZrB_2 are first explored through sessile drop tests, confirming a promising infiltration capability of the melt. The local B-rich environment promoted the development of a dual-phase microstructure within the matrix composed of new sub-micrometric grains and of larger ZrB_2 grains, partially dissolved in the melt and re-precipitated acquiring a nano-sized lamellar eutectic structure.

Role: fabrication of the fibre reinforced UHTC composites by reactive melt infiltration, microstructural analysis

L. Silvestroni, A. Vinci, N. Gilli, L. Zoli, D. Sciti, D. Koch, M. Kuetemeyer, Journal of Alloys and Compounds, 2023, 947, 169521

2023

[Experimental characterization of fatigue life of \$ZrB_2\$ -SiC based ultra high-temperature ceramic matrix composites](#)

Two different methodologies are proposed and applied for the fatigue life evaluation of new ZrB_2 -SiC-based UHTCMCs, with either short or long continuous fibers, leading to the determination of the σ/N curve for the two classes of materials, in combination with numerical analyses.

Role: microstructure study, writing of the microstructure paragraph, review editing

T. Reimer, G.D. Di Martino, D. Sciti, L. Zoli, P. Galizia, A. Vinci, M.A. Lagos, N. Azurmendi, International Journal of Fatigue, 168,107389, 2023

2023

[Synthesis, microstructure and mechanical properties of lamellar \$YB_2C_2\$ – based ultra-high temperature ceramic composites](#)

The potential routes for the synthesis of YB_2C_2 phases at temperatures typical of UHTC sintering, starting from Y_2O_3 , carbon and four different boron sources (B, B_2O_3 , BN, B_4C) and their microstructure was analysed by SEM, XRD and TEM. The mixture with B_4C led to the highest selectivity towards the formation of YB_2C_2 and was selected to fabricate a long carbon fibre reinforced YB_2C_2 ceramic composite, which was mechanically tested.

Role: preparation of the powder mixtures, fabrication of the fibre reinforced composite, high temperature synthesis and sintering, microstructure study, writing of the original draft, microstructure, processing and mechanical properties paragraphs, review editing

A. Vinci*, L. Zoli, L. Silvestroni, N. Gilli, D. Sciti, Journal of the European Ceramic Society, 43(3), 831-841, 2023

2023

[Elevated temperature tensile and bending strength of ultra-high temperature ceramic matrix composites obtained by different processes](#)

Different ZrB_2 -based UHTCMCs produced via SIS, PIP, and RF-CVI were compared in terms of microstructure and mechanical behavior within the Horizon 2020 C3HARME project. Tensile tests up to 1600 °C demonstrated excellent high-temperature structural performance despite significant microstructural differences. The influence of porosity, fiber properties, and residual thermal stresses on the mechanical behavior was investigated.

Role: fabrication of the fibre reinforced UHTC composites, microstructural characterization, writing of the paragraphs on processing, microstructure, oxidation resistance, review editing

2023

[A novel approach for manufacturing of layered, ultra-refractory composites using pliable, short fibre-reinforced ceramic sheets](#)

A new additive technique for manufacturing of short fibre-reinforced ultra-refractory ceramics was developed. Specimens were sintered by hot pressing and the microstructure and mechanical properties were investigated. Functionally graded composites were fabricated by overlapping sheets with a fibre gradient.

Role: slurry preparation, sintering, microstructure study, writing & review editing

M. Mor, A. Vinci, S. Failla, P. Galizia, L. Zoli, D. Sciti, Journal of Advanced Ceramics, 12(1), 155-168, 2023

2022

[Advancements in carbon fibre reinforced ultra-refractory ceramic composites: Effect of rare earth oxides addition](#)

The influence of rare earth (RE) oxides on the microstructure and mechanical properties of carbon fibre-ZrB₂/SiC composites was investigated. Materials were produced by slurry infiltration and hot pressing. The addition of Y₂O₃, La₂O₃ and CeO₂ led to the formation of lamellar boro-carbides that improved the densification, while Sc₂O₃ promoted the formation of (Zr,Sc)B₂ solid solutions in the matrix.

Role: selection of the rare earth oxides, preparation of the ceramic suspensions, fabrication of the UHTC composites via slurry infiltration and sintering, microstructure and compositional analysis, discussion of the mechanical properties, writing of the original draft and review editing.

A. Vinci, L. Silvestroni, N. Gilli, L. Zoli, D. Sciti, Composites Part A, 156, 106858, 2022

2022

[A systematic approach for horizontal and vertical scale up of sintered Ultra-High Temperature Ceramic Matrix Composites for aerospace – Advances and perspectives](#)

IF: 11.322, **Cited:** 13

This paper illustrates the systematic approach adopted for the scale-up of UHTCMCs based on carbon fibre reinforced ZrB₂/SiC composites from laboratory to industrial scale dimensions. The scale-up process covered a period of three years and concerned an increase in diameter of ~10 times (from 40 to 400 mm), and in thickness of ~30 times (from 5 to 160 mm).

Role: planning of activities to process over 10 kg of powders and infiltrate 12 m² of carbon fibres in the frame of few weeks, overlapping over 600 layers of materials for the production of large specimens, microstructure analysis and homogeneity check, writing and review editing of the experimental and microstructure paragraphs.

D. Sciti*, L. Zoli, T. Rheimer, A. Vinci, P. Galizia, Composites Part B, 234, 109709, 2022

[Ablation behaviour of carbon fibre ultra-high temperature composites at oblique angles of attack](#)

Oxyacetylene torch testing was performed at a range of angles of attack on Cf/ZrB₂-SiC-Y₂O₃ composites, from 10° to 90°. The ablation behaviour was studied in-situ with thermography, and the post-ablation morphologies investigated optically and with elemental analysis.

Role: preparation of ad hoc ceramic suspensions for the fabrication of UHTC composites with high solid loadings, microstructure analysis, writing and review editing of the processing and microstructure paragraphs.

B. Baker* et al, Materials & Design, 212, 110199, 2021

2021

[Retained strength of UHTCMCs after oxidation at 2278 K](#)

In the frame of Horizon 2020 European C3HARME research project, the manufacture of ZrB₂-based CMCs was developed through different processes: slurry infiltration and sintering, radio frequency chemical vapour infiltration (RF-CVI) and reactive metal infiltration (RMI). To assess the high temperature stability, the microstructure and mechanical properties after oxidation were investigated.

Role: preparation of ceramic suspensions for the fabrication of UHTC composites via slurry infiltration and sintering, microstructure analysis of all specimens before and after testing, writing and review editing of the processing, microstructure and mechanical properties paragraphs.

[Significant improvement of the self-protection capability of ultra-high temperature ceramic matrix composites](#)

The oxidation behaviour of Cf/ZrB₂-SiC with different fibre architectures, manufactured by slurry impregnation, polymer infiltration and mild pyrolysis, was investigated. Results indicated that a good dispersion of ZrB₂ particles in the polymer derived SiC(O) matrix promoted the formation of compact scales, providing a good compromise between weight and oxidation resistance.

Role: preparation of the ceramic suspensions, supervision of the slurry infiltration process, microstructure analysis and image analysis on the polished specimens, writing and review editing of the processing and microstructure paragraphs.

F. Servadei, L. Zoli, A. Vinci, P. Galizia, D. Sciti, Corrosion Science, 189, 109575, 2021

2021

[Properties of large scale ultra-high temperature ceramic matrix composites made by filament winding and spark plasma sintering](#)

This work was the result of a long term collaboration between different institutions on the scale-up of the production process of UHTCMCs for the fabrication of large components. 150 mm large discs were produced by filament winding and consolidated by spark plasma sintering and mechanically tested.

Role: preparation of the ceramic suspensions, supervision of the filament winding machine, cutting, shaping and assembly of the infiltrated fibre layers, microstructure analysis and homogeneity check, writing and review editing of the experimental and microstructure paragraphs.

D. Sciti, P. Galizia, T. Reimer, A. Schoberth, C.F. Gutiérrez-Gonzalez, L. Silvestroni, A. Vinci, L. Zoli, Composites part B, 216, 108839, 2021

[Influence of pressure on the oxidation resistance of carbon fiber reinforced ZrB₂/SiC composites at 2000 and 2200°C](#)

The influence of pressure on the oxidation resistance of C-ZrB₂/SiC composites was studied. Materials were tested in air at 2000–2200 °C at 1–900 mbar. SiC increase was beneficial up to 1650 °C, then the trend was inverted.

Role: planning of activities during my period abroad at DLR labs, design of the experiments, fabrication of UHTC composites via slurry infiltration and sintering, manual assembly of the ZrO₂ oxidation chamber prototype, supervision of the oxidation tests, microstructure analysis before and after testing, writing of the original draft and review editing.

A. Vinci*, T. Reimer, L. Zoli, D. Sciti, Corrosion Science, 184, 109377, 2021

2021

[Effect of PAN-based and pitch-based carbon fibres on microstructure and properties of continuous Cf/ZrB₂-SiC UHTCMCs](#)

In this paper the microstructure and mechanical properties of two different Cf/ZrB₂-SiC composites reinforced with continuous PyC coated PAN-derived fibres or uncoated pitch-derived fibres were compared. Specimens reinforced with coated PAN-derived fibres provided higher strengths and damage tolerance but the weaker fibre/matrix interface resulted in lower interlaminar shear, off-axis strength and ablation resistance.

Role: preparation of the ceramic suspensions, fabrication of the UHTC composites via slurry infiltration and sintering, microstructure analysis, writing and review editing of the experimental and microstructure paragraphs.

D. Sciti, L. Zoli, A. Vinci, L. Silvestroni, S. Mungiguerra, P. Galizia, Journal of the European Ceramic Society 41(5), 3045-3050, 2021

2020

[Influence of Y₂O₃ addition on the mechanical and oxidation behaviour of carbon fibre reinforced ZrB₂/SiC composites](#)

The influence of Y₂O₃ addition on the microstructure, thermo-mechanical properties and oxidation resistance of carbon fibre reinforced ZrB₂/SiC composites was investigated. Y₂O₃ reacted with oxides impurities and carbon to form novel phases and lower the sintering temperature. Mechanical properties were significantly enhanced but protection against oxygen diffusion was limited due to the partial consumption of SiC.

Role: preparation of the ceramic suspensions, design of the experiments, fabrication of the UHTC composites, microstructure analysis, mechanical properties investigation, oxidation study, data curation, writing of the original draft and review editing.

A. Vinci*, L. Zoli, P. Galizia, D. Sciti, Journal of the European Ceramic Society 40(15), 5067-5075

2020

[Development of UHTCMCs via water based ZrB₂ powder slurry infiltration and polymer infiltration and pyrolysis](#)

Cf/ZrB₂-SiC ultra-high temperature composites were manufactured via aqueous slurry impregnation coupled with polymer infiltration and pyrolysis. Mechanical properties showed the tendency to decrease with increase of the preforms complexity, due to the higher amount of flaws and residual stresses. The materials showed an optimal resistance to oxidation at 1650 °C.

Role: preparation of the ceramic suspensions, supervision of the slurry infiltration process, microstructure analysis, writing and review editing of the microstructure paragraph.

F. Servadei, L. Zoli, P. Galizia, A. Vinci, D. Sciti, Journal of the European Ceramic Society 40(15), 5076-5084, 2020

2020

[Reactive melt infiltration of carbon fibre reinforced ZrB₂/B composites with Zr₂Cu](#)

The microstructure and mechanical properties of carbon fibre reinforced ZrB₂ composites produced by slurry infiltration and consolidated by reactive melt infiltration were investigated. The flexural strength increased with the increase of boron content and the mechanical behaviour was mostly dominated by matrix properties.

Role: design of the experiments during my period abroad at DLR labs, preparation of the ceramic suspensions, fabrication of the UHTC green composites, supervision of the reactive melt infiltration furnace, microstructure analysis, mechanical properties investigation, writing of the original draft and review editing.

A. Vinci*, L. Zoli, P. Galizia, M. Küttemeyer, D. Koch, M. Friess, D. Sciti a Composites part A, 137, 105973, 2020

2020

[Is spark plasma sintering suitable for the densification of continuous carbon fibre - UHTCMCs?](#)

Materials were produced by hot pressing as baseline samples and then by spark plasma sintering (SPS) to compare microstructure and basic mechanical properties. A special emphasis was given to the study of interfaces, in case of both coated and uncoated carbon fibres. SPS allowed for faster sintering but required an adjustment of the temperature to avoid fibre degradation.

Role: preparation of the ceramic suspensions, fabrication of the composites via slurry infiltration and hot pressing, microstructure analysis, writing and review editing of the microstructure paragraph.

L. Zoli, A. Vinci, P. Galizia, C. Gutierrez, S. Rivera, D. Sciti, Journal of the European Ceramic Society 40(7), 2597-2603, 2020

2019

[Influence of fibre content on the strength of carbon fibre reinforced HfC/SiC composites up to 2100 °C](#)

The influence of carbon fibre content on the mechanical behaviour of HfC/SiC composites was investigated up to 2100 °C for specimens containing 40 or 55 vol% fibres. The specimen containing a higher fibre content underwent significant deformation due to low interfacial strength between the fibre plies.

Role: preparation of the ceramic suspensions, design of the experiments, fabrication of the composites via slurry infiltration and hot pressing, microstructure analysis, mechanical characterization at high temperature with a dedicated special furnace during my period abroad at MS&T, writing of the original draft and review editing.

A. Vinci*, L. Zoli, D. Sciti, J. Watts, G. Hilmas, W. Fahrenholtz, Journal of the European Ceramic Society 39(13), 3594-3603, 2019

2019

[Ablation behaviour of ultra-high temperature ceramic matrix composites: Role of MeSi₂ addition](#)

A new class of ZrB₂ composites reinforced with 40 vol% C short fibers and containing 5 vol% SiC in combination with 5 vol% MoSi₂, HfSi₂ or WSi₂ successfully withstood extreme conditions in a oxyacetylene torch. Unlike HfSi₂, MoSi₂ and

WSi₂ formed highly volatile oxides on the surface, which did not offer better protection than the ZrO₂-SiO₂ scale that developed in the baseline.

Role: microstructure analysis before and after testing, image analysis, writing of the microstructure paragraph.

L. Silvestroni, A. Vinci, S. Failla, L. Zoli, V. Rubio, J. Binner, D. Sciti, Journal of the European Ceramic Society 39(9), 2771-2781, 2019

2019

[Arc-jet wind tunnel characterization of ultra-high-temperature ceramic matrix composites](#)

Two samples of Ultra-High-Temperature Ceramic Matrix Composites, with carbon fibers in a ZrB₂-SiC matrix, were exposed to supersonic dissociated air flow, simulating the atmospheric re-entry environment, in an arc-heated facility at specific total enthalpies up to 20 MJ/kg. A zirconium oxide layer formed on the surface, below which the original material is perfectly preserved.

Role: preparation of the ceramic suspensions, fabrication of the composites via slurry infiltration and hot pressing, microstructure analysis, writing of the processing and microstructure paragraph.

S. Mungiguerra, G. Di Martino, A. Cecere, R. Savino, L. Silvestroni, A. Vinci, L. Zoli, D. Sciti, Corrosion Science 149, 18-28, 2019

2019

[Mechanical behaviour of carbon fibre reinforced TaC/SiC and ZrC/SiC composites up to 2100°C](#)

The microstructure and high temperature mechanical properties of continuous carbon fibre reinforced ZrC and TaC composites were investigated. The flexural strength increases by 30% from room temperature to 1500 °C, which was attributed to stress relaxation. At 1800 °C, the strength decreases by 10% and at 2100 °C plastic deformation occurs, which resulted in lower yield strength but higher ultimate strength.

Role: preparation of the ceramic suspensions, design of the experiments, fabrication of the composites via slurry infiltration and hot pressing, microstructure analysis, mechanical characterization at high temperature with a unique, special furnace available in the U.S. during my period abroad at MS&T, data curation, writing of the original draft and review editing.

A. Vinci*, L. Zoli, D. Sciti, J. Watts, G. Hilmas, W. Fahrenholtz, Journal of the European Ceramic Society 39(4), 780-787, 2019

2018

[Toughening effect of non-periodic fiber distribution on crack propagation energy of UHTC composites](#)

Different configurations of continuous carbon fibre-reinforced UHTC composites were fabricated by using electrophoretic deposition (EPD) and slurry infiltration. Non-periodic fibre distribution induced by the EPD process led to an increase in fracture toughness and a slight decrease of flexural strength.

Role: preparation of the ceramic suspensions, fabrication of the composites via slurry infiltration and hot pressing, microstructure analysis, writing of the processing and microstructure paragraphs.

S. Failla, P. Galizia, L. Zoli, A. Vinci, D. Sciti Journal of Alloys & Compounds 777, 612-618, 2018

2018

[On the thermal shock resistance and mechanical properties of novel unidirectional UHTCMCs for extreme environments](#)

IF: 4,996, **Cited:** 63

Carbon fibre reinforced ZrB₂/SiC composites were fabricated and mechanically tested, and were able to sustain a thermal shock severity as high as 1500 °C. The maximum decrease of strength at 1400 °C was 16% of the initial value, indicating that the samples could be shocked at even higher temperature.

Role: preparation of the ceramic suspensions, fabrication of the composites via slurry infiltration and hot pressing, microstructure analysis, writing of the processing and microstructure paragraphs.

L. Zoli, A. Vinci, P. Galizia, C. Melandri, D. Sciti, Scientific Reports, 8, 9148, 2018

2018

[Introduction to H2020 project C3HARME-next generation ceramic composites for combustion harsh environment and space](#)

This paper aims at giving an introduction to the challenges addressed by C3HARME project including (i) the integration between well-established and novel techniques for CMCs and UHTCs production, (ii) the need for very high temperature characterisation, (iii) the meaning of self-healing capability for UHTCMCs, (iv) the contribution of modelling to materials development and (v) the investigation of the microstructure/thermo-mechanical property correlations.

Role: writing of the introduction paragraph, review editing.

D. Sciti, L. Silvestroni, A. Vinci, L. Zoli, *Advances in Applied Ceramics* 117, 70-75, 2018

2018

[Influence of SiC content on the oxidation of carbon fibre reinforced ZrB₂/SiC composites at 1500 and 1650°C in air](#)

The microstructure and the oxidation resistance in air of continuous carbon fibre reinforced ZrB₂-SiC ceramic composites were investigated. Contents above 15 vol.% SiC ensure the formation of a homogeneous protective borosilicate glass that covers the entire sample and minimizes fibre burnout.

Role: preparation of the ceramic suspensions, design of the experiments, fabrication of the composites via slurry infiltration and hot pressing, supervision of the oxidation tests, microstructure analysis before and after testing, writing of the original draft and review editing.

A. Vinci*, L. Zoli, D. Sciti, *Journal of the European Ceramic Society* 38(11), 3767-3776, 2018

2018

[Understanding the mechanical properties of novel UHTCMCs through random forest and regression tree analysis](#)

The microstructure and the mechanical properties of carbon fibre reinforced ZrB₂/SiC composites were investigated by varying the SiC and fibre amounts. The statistical analysis demonstrated that among the possible explanatory variables such as porosity, amount of SiC, fibre content, matrix content, SiC/fibre amount ratio, the one having a major influence on both the flexural strength and fracture toughness is the ratio between SiC and carbon fibre content.

Role: preparation of the ceramic suspensions, design of the experiments, fabrication of over 10 composites via slurry infiltration and hot pressing, microstructure analysis, mechanical characterization, writing of the original draft and review editing.

A. Vinci*, L. Zoli, D. Sciti, C. Melandri, S. Guicciardi, *Materials & Design* 145, 97-107, 2018

2017

[Rapid spark plasma sintering to produce dense UHTCs reinforced with undamaged carbon fibres](#)

Short fibre reinforced ZrB₂/SiC composites were produced by ball-milling and rapid Spark Plasma Sintering (SPS). Careful control of the sintering parameters, such as the heating rate, dwell temperature and holding time are required to produce a fully dense matrix and avoid fibre degradation.

Role: processing of the powders via ball-milling, writing of the processing and microstructure paragraphs.

L. Zoli, A. Vinci, L. Silvestroni, D. Sciti, M. Reece, S. Grasso, *Materials & Design* 130, 1-7, 2017

2017

[Oxidation behavior of a continuous carbon fibre reinforced ZrB₂/SiC composite](#)

The oxidation behaviour in air of carbon fibre reinforced ZrB₂/SiC was investigated via TGA from room temperature to 1500°C. Below 1000°C the kinetics was dominated by an exponential weight loss due to fibre consumption. Above 1000°C, weight loss started to be significantly counterbalanced by weight gain due to the formation of a layer of SiO₂ and B₂O₃. Kinetic parameters were evaluated.

Role: preparation of the ceramic suspensions, design of the experiments, fabrication of the composites via slurry infiltration and hot pressing, microstructure analysis, oxidation study, kinetic equations extrapolation and curve fitting, data curation, writing of the original draft and review editing.

A. Vinci*, L. Zoli, E. Landi, D. Sciti, *Corrosion Science* 127, 129-138, 2017

2021

[Ultra-High Temperature Ceramic Matrix Composites \(book chapter\)](#)

Ultra-High Temperature Ceramic Matrix Composites (UHTCMCs) are a new class of materials designed to merge the best features of ceramic matrix composites (CMCs), like damage tolerance, with those of ultra-high temperature ceramics (UHTCs), like ablation resistance. The most recent manufacturing technologies for the production of UHTCMCs and thermo-mechanical and ablation properties are reviewed here.

Role: writing of the processing, microstructure and mechanical properties paragraphs of continuous carbon fibre reinforced composites obtained by slurry infiltration and sintering or RMI.

L. Zoli, D. Sciti, P. Galizia, A. Vinci, F. Monteverde, S. Failla, L. Silvestroni, Encyclopedia of Materials: Technical Ceramics and Glasses, 2, 340-352, 2021

2025

[Advancements in ultra-high temperature ceramic matrix composites for extreme environments \(Conference Proceedings\)](#)

An overview of the most common processing routes for the fabrication of ultra-high temperature ceramic matrix composites is provided, and the oxidation performance is compared.

Role: preparation of the ceramic suspensions, fabrication of the composites via slurry infiltration and hot pressing, microstructure analysis, oxidation testing, writing of the original draft and review editing.

A. Vinci, L. Zoli, S. Mungiguerra, R. Savino, D. Sciti, Proceedings of the International Astronautical Congress (IAC 2025), Australia, 29 Sept - 3 Oct 2025

2021

[Fabrication and characterization of UHTCMCs \(Conference Proceedings\)](#)

In the framework of the C3harme project, a new class of materials labelled UHTCMCs, consisting of a UHTC matrix reinforced with carbon fibres, has been developed and characterized in order to overcome these challenges. Different fibre reinforcements and sintering techniques have been investigated from the microstructural point of view.

Role: fabrication of the carbon fibre reinforced composites via slurry infiltration and sintering, literature review, writing and review editing.

A. Vinci*, L. Zoli, P. Galizia, L. Silvestroni, C. Gutierrez, S. Rivera, D. Sciti, Proceedings of the 36th ASC technical conference, Texas, 19-23 Sept., 2021

2019

[Ultra-high-temperature ceramic matrix composites for hybrid rocket nozzles \(Conference Proceedings\)](#)

Nozzle throat inserts and complete subscale nozzles were tested, comparing their behaviour to a classical graphite nozzle tested in the same operating conditions. Results showed that UHTCMCs with optimised porosity have strong mechanical properties and outstanding erosion resistance.

Role: Fabrication of the carbon fibre reinforced composites via slurry infiltration and sintering, microstructural analysis.

G. Di Martino, S. Mungiguerra, A. Cecere, R. Savino, L. Zoli, A. Vinci, L. Silvestroni, D. Sciti, Proceedings of the International Astronautical Congress (IAC 2019), Washington, 21-25 Oct. 2019

2018

[Processing and characterization of carbon fibre reinforced ZrB₂/SiC/WC composites \(Conference Proceedings\)](#)

The sintering behaviour and mechanical properties of carbon fibre reinforced ZrB₂/SiC/WC composites was investigated. At 2000°C severe fibre degradation occurs, leading to brittle behaviour, while at 1800°C the ceramic matrix is still very porous. A temperature of 1900°C was found as the best compromise to maximize strength and avoid brittle fracture.

Role: preparation of the ceramic suspensions, fabrication of the composites via slurry infiltration and hot pressing, microstructure analysis, mechanical characterization, writing of the original draft and review editing.

A. Vinci*, L. Zoli, D. Sciti, Proceedings of the 1st Workshop for Young Ceramists, 2018

2018

[Hybrid rockets with nozzle in ultra-high-temperature ceramic composites \(Conference Proceedings\)](#)

In this work the experimental characterization of UHTCMCs for applications in hybrid rockets with HDPE and oxygen have been carried out with a novel, dedicated test set-up. The most suitable materials compositions are selected to develop nozzle throat inserts and complete nozzles. Then, the performances of the rocket with graphite and UHTCMC nozzles are compared and discussed.

Role: fabrication of the carbon fibre reinforced composites via slurry infiltration and sintering, writing of the processing and microstructure paragraphs.

G. Di Martino, S. Mungiguerra, A. Cecere, R. Savino, A. Vinci, L. Zoli, D. Sciti, Proceedings of the International Astronautical Congress (IAC 2018), Germany, 1-5 Oct 2018

2018

[Hybrid rockets with nozzle in ultra-high-temperature ceramic composites](#)

UHTCMCs have been tested in hybrid rockets with HDPE and oxygen. The most suitable materials compositions are selected to develop nozzle throat inserts and complete nozzles. Then, the performances of the rocket with graphite and UHTCMC nozzles are compared and discussed.

Role: fabrication of the carbon fibre reinforced composites via slurry infiltration and sintering, writing of the processing and microstructure paragraphs.

G. Di Martino, S. Mungiguerra, A. Cecere, R. Savino, A. Vinci, L. Zoli, D. Sciti, Proceedings of the International Astronautical Congress, IAC, 2018, 2018-October

2017

[Introduction to H2020 project C3HARME: Next generation ceramic composites for combustion harsh environments and space \(Conference Proceedings\)](#)

This work aims at giving an introduction to a dedicated session that illustrates the most important challenges addressed by C3HARME project, including the integration between well-established and novel techniques for CMCs and UHTCs production, the need for very high temperature characterization, the meaning of self-healing capability for UHTCMCs, etc.

Role: writing of the introduction paragraph, review editing.

D. Sciti*, L. Silvestroni, L. Zoli, A. Vinci, F. Monteverde, Proceedings of ECI conference, UK, 17-20 Sept 2017

● **BREVETTI**

28/05/2020

Process for obtaining composite, ultra-refractory, fibre-reinforced ceramic materials (WO2020104959A1)

D. Sciti, L. Silvestroni, A. Vinci, L. Zoli

Patent application regarding the processing of ultra-high temperature ceramic matrix composites via slurry infiltration of fibres with ceramic suspensions.

● **COMPETENZE**

Competenze professionali

1. **Correlazione microstruttura-proprietà** di materiali ceramici e compositi ceramici fibro-rinforzati
2. **Produzione di compositi ceramici ultra-refrattari, fibro-rinforzati (UHTCMC), mediante slurry infiltration e sintering (Hot Pressing, Spark Plasma Sintering, Gas Pressure Sintering)** di preforme in fibra di carbonio con matrice ceramica a base di boruri, nitrucci e carburi (ZrB_2 , HfB_2 , TiB_2 , ZrC , HfC , TiC , TaC , SiC , WC , B_4C , BN , Si_3N_4) per l'applicazione nell'aerospazio, trasporti ed energia.
3. **Produzione di compositi ceramici e cermet mediante polymer infiltration & pyrolysis e reactive melt infiltration** di preforme in fibra di carbonio con silicio liquido o leghe di zirconio/rame.
4. **Sintesi di polveri ultra-refrattarie** mediante riduzione carbo-boro-termale di ossidi metallici in ambiente controllato per la produzione di boruri e carburi ultra-refrattari.
5. **Caratterizzazione microstrutturale di compositi ceramici** mediante tecniche di microanalisi come microscopio ottico digitale, microscopio elettronico a scansione (SEM), spettroscopia a dispersione di energia (EDS) e diffrazione a raggi X (XRD).
6. **Caratterizzazione termo-meccanica di compositi ceramici** fibro-rinforzati mediante l'uso di macchine speciali, accoppiate con forni in ambiente controllato per test meccanici fino a 2300°C.

7. **Caratterizzazione del comportamento in ossidazione** di compositi ceramici fibro-rinforzati mediante l'uso di forni ad aria fino a 1700°C, analisi termo-gravimetrica (TGA), calorimetria a dispersione di calore (DSC), analisi termica differenziale (DTA), e laser flash per la misura della conducibilità termica.
8. **Caratterizzazione della resistività elettrica** di compositi ceramici mediante sonda a 4 punti (Kelvin) da temperatura ambiente a 800°C
9. **Caratterizzazione reologica** di sospensioni ceramiche mediante viscosimetro dinamico e misure del potenziale zeta, e messa a punto di slurry ad alto contenuto solido per il processo di slurry infiltration.
10. **Misura della durezza Vickers** mediante l'uso di indenter accoppiato a microscopio ottico.
11. **Misura della resistività elettrica** mediante tecnica a 4 punti a temperatura ambiente e alta temperatura.
12. **Analisi di immagine** di superfici lucide o di frattura per la misura della percentuale volumetrica delle varie fasi, tra cui il contenuto di fibre.
13. **Analisi e identificazione di specie chimiche** mediante spettroscopia UV-Vis e gas cromatografia per l'analisi dei prodotti di reazione.
14. **Analisi dell'area superficiale e distribuzione delle porosità** mediante analisi BET, e identificazione della temperatura di attivazione mediante TPR.
15. **Uso di attrezzi da lavoro e utensili elettrici** come macchine da taglio, mole, lappatrici manuali e automatiche, trapano verticale, e la lucidatura di materiali ceramici.

Attività di supporto

1. **Gestione e utilizzo di grandi infrastrutture per il sintering** di materiali ceramici ultra-refrattari, fibro-rinforzati, mediante Hot Pressing, Spark Plasma Sintering, Gas Pressure Sintering e Pressureless Sintering
2. **Gestione del laboratorio per la produzione di UHTCMCs**
3. **Supporto al referente degli acquisti** per l'acquisto di materie prime o apparecchiature su MEPA o mediante indagine di mercato, e rapporto diretto con le aziende.

Competenze informatiche

1. **Microsoft Office** (Word, Excel, Powerpoint, Outlook)
2. **Zeiss Sigma** (SEM analysis)
3. **INCA, Aztec** (EDS analysis)
4. **MDI Jade 6.0, XPert** (XRD analysis)
5. **ImageJ, ImagePro Analyser 7.0** (Image analysis)
6. **Mendeley, Zotero** (Reference tool)
7. **Factsage 7.0, HSC Chemistry 6.0** (Thermodynamics analysis)

PRESENTAZIONI A CONFERENZA E POSTER

List of authored conference presentations (* = presenting author)

Oxidation resistance of Cf/ZrB₂-SiC composites fabricated by different techniques: HP, PIP and LSI

A. Vinci, L. Zoli, M. Mor, M. Friess, D. Sciti
ECI 2025, Hokuto, Yamanashi (Japan), October 27-31, 2025

Recent advances on ultra-high temperature ceramic matrix composites

A. Vinci, L. Zoli, M. Mor, D. Sciti
Conferenza di dipartimento DSCTM 2025, Bologna (Italy), October 21-23, 2025

Advancements in ultra-high temperature ceramic matrix composites for extreme environments

A. Vinci, L. Zoli, S. Mungiguerra, R. Savino, D. Sciti
IAC 2025, Sydney (Australia), September 29 – October 3, 2025

Processing and characterization of ZrB₂-based UHTCMCs obtained by Liquid silicon infiltration

A. Vinci*, L. Zoli, M. Friess, D. Sciti
ECERS 2025, Dresden (Germany), August 31 – September 4, 2025

Oxidation resistance of UHTCMCs fabricated by Liquid Silicon Infiltration and Sintering

A. Vinci*, L. Zoli, M. Friess, D. Sciti
PACRIM 2025, Vancouver (Canada), May 4-9, 2025

F-6. Oxidation behaviour of ZrB₂/SiC-based UHTCMCs with HfB₂ graded structures

A. Vinci*, L. Zoli, D. Sciti, S. Mungiguerra, A. Cecere, R. Savino
ECERS 2023, Lyon (France), July 2-6, 2023

Synthesis and mechanical characterization of YB₂C₂-based ceramics

A. Vinci*, L. Zoli, L. Silvestroni, N. Gilli, D. Sciti

Ceramics in Europe (ECerS'22, ICC9), Krakow(Poland), July 10-14, 2022

Fabrication and characterization of UHTCMCs

A. Vinci*, L. Zoli, P. Galizia, L. Silvestroni, C. Gutiérrez, Sergio Rivera, D. Sciti
36th ASC virtual conference, Texas, September 19-23, 2021

Effect of oxide-based additives on the microstructure and thermo-mechanical behaviour of carbon fibre reinforced ZrB₂/SiC composites

A. Vinci*, L. Zoli, L. Silvestroni, P. Galizia, D. Sciti
ICC8 virtual conference Korea, April 25-30, 2021

Effect of group IIIb rare earth oxides on the microstructure and thermomechanical properties of carbon fibre reinforced ZrB₂/SiC composites

A. Vinci*, L. Zoli, D. Sciti
ICACC'21, virtual conference, Daytona Beach (FL), February 8-11, 2021

Processing and characterization of carbon fibre reinforced ZrB₂/SiC/WC composites

A. Vinci*, L. Zoli, D. Sciti
ECerS 2019, Torino(Italy), June 17-20, 2019

Reactive Melt Infiltration of carbon fibre reinforced ZrB₂ composites with Zr₂Cu

A. Vinci*, L. Zoli, D. Sciti, M. Küttemeyer, D. Koch
ICACC'19, Daytona Beach (FL), January 27-31, 2019

Damage tolerant carbon fibre reinforced ZrB₂/SiC composites

A. Vinci*, L. Zoli, D. Sciti, M. Gutierrez, S. Riveira
ICACC'19, Daytona Beach (FL), January 27-31, 2019

Oxidation resistance of carbon fibre reinforced ZrB₂/SiC composites at T>2000°C

A. Vinci*, L. Zoli, D. Sciti, T. Reimer, D. Koch
ICACC'19, Daytona Beach (FL), January 27-31, 2019

Fabrication and characterization of carbon fibre reinforced ZrB₂/SiC/WC composites

A. Vinci*, L. Zoli, D. Sciti
Workshop for Young Ceramists – Speech contest, Bologna (Italy), November 26-27, 2018 (2nd Best oral presentation)

Mechanical behaviour of carbon fibre reinforced carbides up to 2100°C

A. Vinci*, L. Zoli, D. Sciti, J. Watts, G. Hilmas, W.G. Fahrenholtz
Materials.it 2018, Bologna(Italy), October 22-26, 2018

Fabrication and characterization of carbon fibre reinforced UHTCs

A. Vinci*, L. Zoli, D. Sciti
YCN workshop 2018, Smolenice (Slovakia), October 2-4, 2018

Thermo-mechanical behavior of novel UHTCMCs with a carbide matrix at temperatures above 1800°C

A. Vinci*, L. Zoli, D. Sciti, J. Watts, G. Hilmas, W.G. Fahrenholtz
ICACC'18, Daytona Beach (FL), January 21-26, 2018

Oxidation behaviour at 1650°C of carbon fibre reinforced ZrB₂/SiC composites

A. Vinci*, L. Zoli, D. Sciti
ECI, Windsor (UK), September 17-20, 2017

Effect of SiC on the oxidation resistance of carbon fibre reinforced ZrB₂/SiC

A. Vinci*, L. Zoli, D. Sciti
ECerS 2017, Budapest (Hungary), July 9-13, 2017

Effect of SiC addition on the mechanical properties of ZrB₂/SiC/Cf based UHTCMCs

A. Vinci*, L. Zoli, C. Melandri, D. Sciti
Materials.it 2016, Aci Castello, December 12-16, 2016

List of co-authored conference presentations

Tribological characterization of UHTCMCs for brake applications

M. Mor, M. Meiser, D. Sciti, A. Vinci, N. Langhof, S. Schaffner
Ceramics in Europe (ECerS'22, ICC9), Krakow(Poland), July 10-14, 2022

Manufacturing of UHTCMCs: polymer infiltration and pyrolysis vs sintering

L. Zoli, S. Servadei, A. Vinci, P. Galizia, D. Sciti

Manufacturing of UHTCMCs via powder slurry infiltration and polymer infiltration and pyrolysis (vs) sintering

L. Zoli, S. Servadei, P. Galizia, A. Vinci, D. Sciti
ICC8, virtual conference Korea, April 25-30, 2021

Environmental barrier ability and safety aspects of UHTCMCs above 2273 K

P. Galizia, L. Zoli, A. Vinci, D. Sciti
ICACC'21, virtual conference Daytona Beach (FL), February 8-11, 2021

Microstructure and mechanical properties of ZrB₂/SiC based UHTCMCs for brakes applications

M. Mor, A. Vinci, P. Galizia, L. Zoli, D. Sciti
ICACC'21, virtual conference Daytona Beach (FL), February 8-11, 2021

Experimental investigation on sintered UHT-CMC composites for Combustion Harsh Environments and Space

S. Mungiguerra, G. Di Martino, R. Savino, L. Zoli, A. Vinci, D. Sciti
HT-CMC/10th, Bordeaux(France), September 22-26, 2019

High-Temperature Mechanical Characterization of UHTCMCs

T. Reimer, D. Sciti, D. Koch, M. Kuetemeyer, A. Vinci, L. Silvestroni, P. Galizia, F. Monteverde, S. Rivera
HT-CMC/10th, Bordeaux(France), September 22-26, 2019

Retained strength of UHTCMCs treated above 2273 K in oxidizing environment

F. Monteverde, D. Sciti, L. Silvestroni, L. Zoli, F. Saraga, A. Vinci, P. Galizia, T. Reimer
HT-CMC/10th, Bordeaux(France), September 22-26, 2019

The effect of PAN or pitch-based C fibres on the microstructure and properties of continuous Cf- ZrB₂/SiC UHTCMCs

D. Sciti, L. Zoli, A. Vinci, P. Galizia, L. Silvestroni, T. Reimer, S. Rivera
HT-CMC/10th, Bordeaux(France), September 22-26, 2019

UHTCMCs with a boride matrix for novel rocket nozzles

L. Zoli, D. Sciti, L. Silvestroni, P. Galizia, A. Vinci
CICC-11th, Kunming (China), May 25-29, 2019

The challenging mechanical characterization of continuous fiber-reinforced ultra-high temperature ceramics for extreme conditions

P. Galizia, L. Zoli, A. Vinci, S. Failla, D. Sciti
Materials.it 2018, Bologna(Italy), October 22-26, 2018

Ultra-high temperature Ceramic matrix composites for extreme environments

L. Zoli, A. Vinci, P. Galizia, D. Sciti
Materials.it 2018, Bologna (Italy), October 22-26, 2018

Mechanical properties and microstructure of unidirectional UHTCMCs

L. Zoli, A. Vinci, S. Failla, P. Galizia, D. Sciti
CIMTEC, Perugia (Italy), June 4-8, 2018

Developing UHTCMCs: effect of matrix additives on the resistance to oxidation

D. Sciti, A. Vinci, L. Zoli
PACRIM12, Waikoloa, Hawaii (US), May 21-26, 2017

List of Posters

Hi-Tech Ceramics and Composites for Severe Environments

D. Sciti, F. Monteverde, L. Silvestroni, L. Zoli, A. Vinci, S. Failla
Conferenza di dipartimento CNR, Assisi (Italy) September 24-26, 2018

Oxidation behavior of a continuous carbon fiber reinforced ZrB₂/SiC/Si₃N₄ composite

A. Vinci*, L. Zoli, E. Landi, D. Sciti
WGCC - Cuenca (Spain), September 28-30, 2016

Effect of metal oxide additives on the activity and stability of medium temperature Water Gas Shift catalysts

C. Lucarelli, R. Faure, G. Fornasari, D. Gary, N. Schiaroli, A. Vaccari, A. Vinci
GIC 2015, Amantea (Italy), June 14-17, 2015

List of invited presentations (* = presenting author)

Advancement in UHTCMCs: processing and oxidation resistance

A. Vinci*, L. Zoli, M. Mor, D. Sciti
ACA XIII 2025, Belgrade (Serbia), September 8-10, 2025

Nb-based coatings to improve the oxidation resistance of UHTCMCs at 1700°C

A. Vinci*, J.E. Foerster, R. Naraparaju, D. Sciti
ECI 2024, Giardini Naxos (Italy), April 14-19, 2024

Influence of Nb coatings on the oxidation resistance of C-ZrB₂/SiC composites up to 1700°C

A. Vinci*, J.E. Foerster, R. Naraparaju, D. Sciti
ICACC 2024, Daytona Beach (FL), United States, January 28 – February 2, 2024

Scale up and Testing of UHTCMCs

D. Sciti, A. Vinci*, L. Zoli
ACA XI 2023, Belgrade (Serbia), September 18-20, 2023

Ultra-high Temperature Ceramic Matrix Composites: Processing, Characterization & Applications

A. Vinci*, L. Zoli, D. Sciti, S. Mungiguerra, A. Cecere, R. Savino
HT-CMC 2023, Jeju (South Korea), August 27-31, 2023

Will UHTCs and composites be enabling solutions for harsh environments?

D. Sciti*, L. Silvestroni, F. Monteverde, P. Galizia, S. Failla, A. Vinci
ECERS 2023, Lyon (France), July 2-6, 2023

Microstructural and mechanical properties of different ultra-high temperature CMCs: tensile and flexural strength up to 1800°C

P. Galizia*, D. Sciti, J. Binner, V. Venkatachalam, M. Lagos, F. Servadei, L. Zoli, T. Reimer
ECERS 2023, Lyon (France), July 2-6, 2023

Processing and characterization of layered UHTCMCs reinforced with continuous or discontinuous carbon fibers

A. Vinci*, D. Sciti, P. Galizia, S. Failla, L. Zoli
ECI 2022, Santa Fe (NM), USA, November 13-18, 2022

Extending carbon fibre ceramic composites from boride to carbide and oxide matrices

D. Sciti*, A. Vinci, P. Galizia, S. Failla, L. Zoli
Ceramics in Europe (ECerS'22, ICC9), Krakow (Poland), July 10-14, 2022

Studying the densification of B₄C-TiB₂ composites by hot pressing and pressureless sintering method

S. Failla*, A. Vinci, L. Silvestroni, N. Gilli, D. Sciti, L. Zoli
ICACC'21, virtual conference Daytona Beach (FL), USA, February 8-11, 2021

Fabrication and characterization of carbon fibre reinforced UHTC composites

A. Vinci*, L. Zoli, D. Sciti
ICACC'20, Daytona Beach (FL), USA, January 24-31, 2020

Is sintering technology suitable for the densification of ultra-high temperature ceramic matrix composites?

L. Zoli*, A. Vinci, P. Galizia, C. Gutiérrez-Gonzalez, S. Rivera, D. Sciti
PACRIM13, Okinawa (Japan), October 27 - November 1, 2019

Sintered UHTCMCs for aerospace components reusable beyond 2500°C

D. Sciti*, L. Zoli, A. Vinci, T. Reimer, B. Esser, S. Mungiguerra, R. Savino
PACRIM13, Okinawa (Japan), October 27 - November 1, 2019

Spring(s) in harsh environments: micromechanical modelling of UHTCMCs

P. Galizia*, L. Zoli, A. Vinci, S. Failla, F. Saraga, D. Sciti
ENGECER19, Smolenice Castle (Slovakia), May 14, 2019

Advances in the processing and characterization of UHTC-Composites for Aerospace

D. Sciti*, A. Vinci, P. Galizia, L. Silvestroni, L. Zoli
CC7, Brazil, June 17-2, 2018

Hi-Tech Ceramics and Composites for Harsh Environments

● **ATTIVITÀ DI SERVIZIO ALLA COMUNITÀ SCIENTIFICA**

27/02/2025 – 28/02/2026

Responsabile di laboratorio UHTCs presso ISSMC - CNR (Prot. 0057081/2025)

Responsabile del laboratorio di produzione dei materiali compositi ultra-refrattari (UHTCs) presso l'Istituto di Scienza, Tecnologia e Sostenibilità per lo Sviluppo dei Materiali Ceramici - Consiglio Nazionale delle Ricerche (ISSMC - CNR)

02/04/2025 – 16/05/2025

Editor

Editor del libro "Ballistic Protection", ISBN: 9783036407678

Link <https://doi.org/10.4028/b-6G91y5>

01/02/2023 – 08/09/2023

Guest Editor

Guest Editor per lo special issue "Advances in Ultra-high Temperature Ceramics and Composites" per "Open Ceramics"

Link <https://www.sciencedirect.com/special-issue/10THP0SG5FB>

Peer Reviewer

Reviewer di oltre 70 articoli per Peer-review journals: Corrosion Science (20), Journal of the European Ceramic Society (40), Materials (6), Ceramics International (3), Nature (1), International Journal of Applied Ceramic Technology (1), Journal of Alloys and Compounds (2)

● **DIDATTICA**

20/04/2026

Webinar 2026 Italy/Türkiye Joint Chapters

Lecture (1h) su "Processing and characterization of ultra-high temperature ceramic matrix composites" per Italy Chapter and Türkiye Chapter Webinar Series, organizzato dalla American Ceramic Society

01/10/2025 – 25/01/2026

Tutorato di "Chimica generale ed inorganica con lab." per l'università di Bologna

Tutorato (31h) di "Chimica generale ed inorganica con lab." del 1° anno di LT in "Chimica e Tecnologie per l'ambiente ed i Materiali" per l'università di Bologna, sede di Faenza

01/10/2024 – 25/01/2025

Tutorato di "Chimica generale ed inorganica con lab." per l'università di Bologna

Tutorato (45h) di "Chimica generale ed inorganica con lab." del 1° anno di LT in "Chimica e Tecnologie per l'ambiente ed i Materiali" per l'università di Bologna, sede di Faenza

01/10/2023 – 25/01/2024

Tutorato di "Chimica generale ed inorganica con lab." per l'università di Bologna

Tutorato (36h) di "Chimica generale ed inorganica con lab." del 1° anno di LT in "Chimica e Tecnologie per l'ambiente ed i Materiali" per l'università di Bologna, sede di Faenza

01/10/2022 – 18/01/2023

Tutorato di "Chimica generale ed inorganica con lab." per l'università di Bologna

Tutorato (36h) di "Chimica generale ed inorganica con lab." del 1° anno di LT in "Chimica e Tecnologie per l'ambiente ed i Materiali" per l'università di Bologna, sede di Faenza

01/11/2019 – 29/06/2023

Co-supervisione dello studente di dottorato Matteo Mor per il corso in Scienza e Tecnologia dei Materiali dell'università di Parma

Co-supervisione dello studente Matteo Mor per il corso di dottorato in "Scienza e Tecnologia dei Materiali" dell'università di Parma - Tesi: Fabrication and characterization of UHTCMCs for tribological applications

05/12/2025

Lecture su "High temperature corrosion of ceramic materials" per l'università di Ferrara

Lecture (1h) su "High temperature corrosion of ceramic materials" per il corso di "Degradazione e Protezione dei materiali ad alta temperatura" del 2° anno di LM in "Ingegneria dei Materiali" dell'università di Ferrara

13/12/2022

Lecture su "High temperature corrosion of ceramic materials" per l'università di Ferrara

Lecture (1h) su "High temperature corrosion of ceramic materials" per il corso di "Degradazione e Protezione dei materiali ad alta temperatura" del 2° anno di LM in "Ingegneria dei Materiali" dell'università di Ferrara

18/05/2022

Lecture su "High temperature corrosion of ceramic materials" per l'università di Ferrara

Lecture (1h) su "High temperature corrosion of ceramic materials" per il corso di "Degradazione e Protezione dei materiali ad alta temperatura" del 2° anno di LM in "Ingegneria dei Materiali" dell'università di Ferrara

06/06/2022

Lecture su "Ultra-high temperature ceramic (UHTC) composites for aerospace" per l'università di Bologna

Lecture (1h) su "Ultra-high temperature ceramic (UHTC) composites for aerospace" per il corso "Processi ed applicazioni dei materiali polimerici e ceramici" del dottorato in "Chimica" dell'università di Bologna

● **PROTOTIPI**

Manufacturing of ceramic composites of large dimensions.

Scale up of ultra-high temperature ceramic matrix composites and fabrication of large tiles ($\varnothing = 400$ mm) and thick blocks ($h = 130$ mm), from which rocket nozzles and tiles for thermal protection systems were machined.

Link <https://doi.org/10.1016/j.compositesb.2022.109709>

● **REPORT TECNICI**

22/04/2026

Market survey and procurement assessment of commercial sintered ceramic media for cryogenic packed-bed energy storage applications (Report tecnico ISSMC-CNR n°9/2026)

Raccolta dati e identificazione dei materiali idonei all'applicazione nel thermal storage.

30/11/2022

WP1 Report: production of prototypes and thermal conductivity of samples (Report tecnico ISSMC-CNR n°38/2022)

Production of thin UHTCMC-based prototypes, microstructure analysis and thermal conductivity measurements.

31/10/2022

WP0 Report: preliminary screening of the electrical resistivity, CTE, microstructure and machinability of UHTCMCs (Report tecnico ISSMC-CNR n°37/2022)

Study of the electrical resistivity, CTE, microstructure and machinability of ZrB₂/SiC-based UHTCMCs and conventional SiC-based composites.

19/07/2021

Influence of processing parameters on the microstructure and mechanical properties of fibre-reinforced ZrB₂/SiC composites (Rapporto Interno ISTECCNR n°2/2021)

Study of processing parameters (powder mixing, slurry infiltration time and temperature) on the properties of ZrB₂/SiC composites and identification of the best processing route.

19/07/2021

Synthesis of YBC phases from Y₂O₃, B and C (Rapporto Interno ISTECCNR n°1/2021)

Study of the synthesis routes to obtain novel lamellar phases based on YB₂C₂ via boro-carbothermal reduction of Y₂O₃. SEM/EDS analysis followed by XRD analysis to identify all the formed phases and select the best synthesis route.

12/07/2016

Viscosimetric analysis of ZrB₂ – SiC – Si₃N₄ based suspensions (Rapporto Interno ISTECCNR n°11/2016)

Rheology study of ZrB₂/SiC/Si₃N₄ based aqueous suspensions via viscosimetry, study of the viscosity dependence with the solid loading and pH, selection of the best suspension for the infiltration of ceramic matrix composites.

● **CORSI E WORKSHOPS**

Partecipazione a corsi di formazione, scuole e training

1. **Training per l'uso di forno speciale Spark Plasma Sintering**

FCT Systeme GmbH, Faenza

18/03/2025 – 19/03/2025

2. **Advancements and most recent innovations in EDS and EBSD**

Oxford Instruments, Istituto di Scienza, Tecnologia e Sostenibilità dei Materiali Ceramici, Faenza

13/05/2025

3. **EDS, microanalisi a dispersione di energia**

Mediasystem Lab, BeFactory, Rovereto

14/05/2024 – 15/05/2024

4. **La microscopia elettronica applicata al processo produttivo della ceramica e degli inchiostri**

Mediasystem Lab, Università di Modena e Reggio Emilia

8/05/2018

5. **Public Speaking: Tecniche per una efficace comunicazione**

Università di Parma

4/05/2018

6. **Come scrivere un progetto Marie Curie**

Università di Parma

12/03/2018 – 13/03/2018

7. **Tecniche di analisi superficiale (XPS-ESCA/AES/ToF-SIMS): principi base e applicazioni industriali**

Università di Bologna

1/02/2018 – 2/02/2018

8. **Short course on mechanical properties of ceramics**

Daytona Beach (FL), Stati Uniti

25/01/2018 – 26/01/2018

9. **Cristallografia a raggi X**

Università di Parma

29/05/2017 – 1/06/2017

10. **Come massimizzare l'impatto in HORIZON 2020**

Università di Parma

11/11/2016

11. **Gli aspetti legali e finanziari di un progetto HORIZON 2020**

Università di Parma

7/07/2016

12. **CV day: Progettare e gestire il proprio percorso professionale**

Università di Parma

6/05/2016

13. Leghe leggere e compositi a matrice metallica – corso (4 cfu) del corso di Laurea in Scienze e tecnologie per l'ambiente

Università di Bologna, sede di Faenza
1/02/2016 – 1/06/2016

14. Materiali inorganici – corso (4 cfu) del corso di Laurea in Scienze e tecnologie per l'ambiente

Università di Bologna, sede di Faenza
1/02/2016 – 1/06/2016

15. Intellectual property protection – A view from the European Patent Office

Università di Parma
3/12/2015 – 4/12/2015

16. 2° Sinchem School Erasmus+

Università di Bologna
16/02/2015 – 17/02/2015

Partecipazione a workshops

1. European workshop on ceramic matrix composites: insights, innovations & best practices

Kilometro Rosso, Bergamo
31/03/2025 – 1/04/2025

2. Workshop IC-ISSMC

(Webinar) Istituto di Scienza, Tecnologia e Sostenibilità dei Materiali Ceramici, Faenza
20/02/2025

3. 1st International Workshop for UHTCs and UHT-CMCs at DLR

Deutsches Zentrum für Luft- und Raumfahrt, DLR (German Aerospace Center), Colonia (Germania)
13/07/2023 – 14/07/2023

4. Acers Winter Workshop on advanced ceramics 2020

Daytona Beach (FL), Stati Uniti
24/01/2020 – 28/01/2020

5. ACerS Winter Workshop on advanced ceramics 2019

Daytona Beach (FL), Stati Uniti
25/01/2019 – 29/01/2019

6. Workshop for Young Ceramists

Area della Ricerca del CNR, Bologna
26/11/2018 – 27/11/2018

7. ACerS Winter Workshop on advanced ceramics 2018

Daytona Beach (FL), Stati Uniti
19/01/2018 – 23/01/2018

8. Workshop teorico pratico per preparativa SEM

Università degli studi di Modena e Reggio Emilia
19/05/2016

9. International workshop on graphene/ceramic composites (WGCC)

Cuenca, Spagna
28/09/2016 – 30/09/2016

● **PUBLIC ENGAGEMENT**

Attività finalizzate alla divulgazione della ricerca sui materiali ceramici avanzati e sulle tecnologie aerospaziali a un pubblico non specialistico, inclusi studenti e pubblico generale.

1. Open Day CNR-ISSMC (Prot. 0231591/2026)

Dimostrazione shock termico su ceramici tradizionali e compositi fibrorinforzati
CNR-ISSMC, Faenza
15/05/2026

2. Research to Business (R2B)

Banchetto espositivo su ceramici fibro-rinforzati
Area della Ricerca del CNR, Bologna
26/06/2024

2. Open Day CNR-ISSMC (Prot. 0129797/2023)

Accoglienza
CNR-ISSMC, Faenza
13/04/2023

● **PATENTE DI GUIDA**

B

Autorizzo il trattamento dei miei dati personali presenti nel CV ai sensi dell'art. 13 d. lgs. 30 giugno 2003 n. 196 - "Codice in materia di protezione dei dati personali" e dell'art. 13 GDPR 679/16 - "Regolamento europeo sulla protezione dei dati personali".