

ALL. N. 1

BUSTA N. 1 - PROVA N. 1

1) Leggere e tradurre il seguente testo:

"Thermogravimetric analysis (TGA) is conducted on an instrument referred to as a thermogravimetric analyzer. A thermogravimetric analyzer continuously measures mass while the temperature of a sample is changed over time. Mass, temperature, and time are considered base measurements in thermogravimetric analysis while many additional measures may be derived from these three base measurements.

A typical thermogravimetric analyzer consists of a precision balance with a sample pan located inside a furnace with a programmable control temperature. The temperature is generally increased at constant rate (or for some applications the temperature is controlled for a constant mass loss) to incur a thermal reaction. The thermal reaction may occur under a variety of atmospheres including: ambient air, vacuum, inert gas, oxidizing/reducing gases, corrosive gases, carburizing gases, vapors of liquids or "self-generated atmosphere"; as well as a variety of pressures including: a high vacuum, high pressure, constant pressure, or a controlled pressure." [Wikipedia, "Thermogravimetric analysis"]

2) Discutere il principio di funzionamento dell'analisi TGA.

3) Il candidato illustri le funzioni e l'organizzazione di un Dipartimento

ALL - 1

## BUSTA N. 2 - PROVA N. 2

1) Leggere e tradurre il seguente testo:

"Differential scanning calorimetry can be used to measure a number of characteristic properties of a sample. Using this technique it is possible to observe fusion and crystallization events as well as glass transition temperatures  $T_g$ . DSC can also be used to study oxidation, as well as other chemical reactions.[13][14][16]

Glass transitions may occur as the temperature of an amorphous solid is increased. These transitions appear as a step in the baseline of the recorded DSC signal. This is due to the sample undergoing a change in heat capacity; no formal phase change occurs.[13][15]

As the temperature increases, an amorphous solid will become less viscous. At some point the molecules may obtain enough freedom of motion to spontaneously arrange themselves into a crystalline form. This is known as the crystallization temperature ( $T_c$ ). This transition from amorphous solid to crystalline solid is an exothermic process, and results in a peak in the DSC signal. As the temperature increases the sample eventually reaches its melting temperature ( $T_m$ ). The melting process results in an endothermic peak in the DSC curve. The ability to determine transition temperatures and enthalpies makes DSC a valuable tool in producing phase diagrams for various chemical systems.[13]" [Wikipedia, "Differential scanning calorimetry"]

2) Discutere il principio di funzionamento dell'analisi DSC.

3) Il candidato descriva ruolo e principali funzioni di un Direttore di Dipartimento

All. 1

BUSTA N. 3 - PROVA N. 3

1) Leggere e tradurre il seguente testo:

"Differential scanning calorimetry can be used to measure a number of characteristic properties of a sample. Using this technique it is possible to observe fusion and crystallization events as well as glass transition temperatures  $T_g$ . DSC can also be used to study oxidation, as well as other chemical reactions.[13][14][16]

Glass transitions may occur as the temperature of an amorphous solid is increased. These transitions appear as a step in the baseline of the recorded DSC signal. This is due to the sample undergoing a change in heat capacity; no formal phase change occurs.[13][15]

As the temperature increases, an amorphous solid will become less viscous. At some point the molecules may obtain enough freedom of motion to spontaneously arrange themselves into a crystalline form. This is known as the crystallization temperature ( $T_c$ ). This transition from amorphous solid to crystalline solid is an exothermic process, and results in a peak in the DSC signal. As the temperature increases the sample eventually reaches its melting temperature ( $T_m$ ). The melting process results in an endothermic peak in the DSC curve. The ability to determine transition temperatures and enthalpies makes DSC a valuable tool in producing phase diagrams for various chemical systems.[13]"

2) Cosa si intende per temperatura di transizione vetrosa?

3) Il candidato illustri gli organi di un Dipartimento.