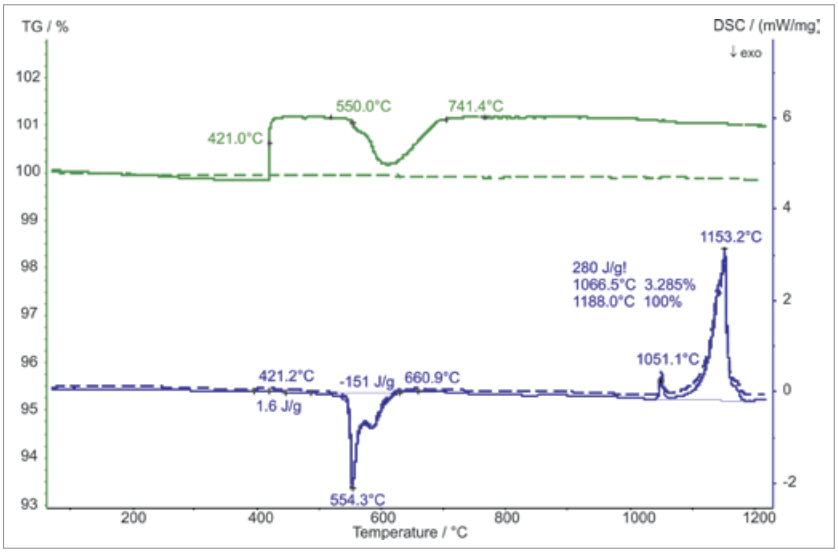
APPLICATION**SHEET**

METALS/ALLOYS – METAL INDUSTRY RESEARCH

AMORPHOUS ALLOYS

(HERE: IRON BORIDE)

Amorphous alloys like, e.g. iron boride, do not possess a crystalline order on a macroscopic scale like their crystalline versions. They are produced by rapid cooling of the melt. Amorphous alloys distinguish themselves through higher stiffness and hardness and higher corrosion resistance. They behave fully elastic at small deformations but can not stand larger deformations since they tend to break. These properties result in advanced applications such as scalpel blades, scratch-resistant housings, jewels, golf clubs, tennis rackets or airplane and space applications. The soft-magnetic properties of amorphous alloys lead to applications as transformers or anti-theft barcodes.



Instrument

STA 449 ***F1*** *Jupiter®*

Test Conditions

Temperature range	RT ... 1200°C
Heating/cooling rates	20 K/min
Atmosphere	argon (70 ml/min)
Sample mass	approx. 20 mg
Crucible	Pt + Al_2O_3 liners
Sensor	TG-DSC type s

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Results

Two STA measurements were carried out: The full lines were obtained in a magnetic field gradient and the dashed lines without a magnetic field (standard conditions). Both DSC signals are almost identical, significant differences were observed in the TG signal. At a peak temperature of 421°C, the DSC signal showed a small endothermic peak which is due to the Curietransition (ferromagnetic to paramagnetic) of the amorphous sample. This transition has a significant effect on the TG signal (inflection point at 421°C) since a magnetic sample experiences a force in a magnetic field gradient. Between ~500°C and ~650°C, the DSC signal exhibited overlapping exothermic effects with an entire enthalpy of -151 J/g which are due to crystallization. Interestingly, the TG signal indicates a magnetic "re-entrance" and again the loss of ferromagnetism during the crystallization process between 550°C and 741°C. The endothermic DSC peaks above 1000°C are most probably due to melting of the sample.

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