

### 论文摘要

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## 非晶合金的晶化动力学与初生相的内在联系

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**摘 要:**通过差示扫描量热法(DSC)研究了 $Zr_{60}Al_{15}Ni_{25}$ 非晶合金的晶化动力学。X射线衍射(XRD)和能谱(EDS)分析结果表明: $Zr_{60}Al_{15}Ni_{25}$ 非晶合金晶化过程中的初生相为复杂三元化合物 $Al_2NiZr_6$ 和 $AlNi_4Zr_5$ 。非晶合金的有效晶化激活能反映了晶化初生相与非晶相间的结构差异,二者结构差异越大,有效晶化激活能就越高, $Zr_{60}Al_{15}Ni_{25}$ 非晶合金的有效晶化激活能高达345 kJ/mol;当合金高温熔体快冷过程中的初生相与非晶合金的晶化初生相一致时,晶化动力学参数能够实际反映合金的玻璃形成能力,相反则不能。

**关键字:** 非晶合金; 晶化动力学; 初生相; 玻璃形成能力

## Correlation between crystallization kinetics of amorphous alloys and primary phases during crystallization

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**Abstract:**The crystallization kinetics of  $Zr_{60}Al_{15}Ni_{25}$  amorphous alloy was investigated by differential scanning calorimetry (DSC). The results of X-ray diffraction (XRD) and energy dispersion spectrum (EDS) indicate that the primary phases are complicated  $Al_2NiZr_6$  and  $AlNi_4Zr_5$  during the crystallization of  $Zr_{60}Al_{15}Ni_{25}$  amorphous alloy. The results suggest that the essence of effective activation energy of an amorphous alloy reflects the structure difference between the primary phases and the amorphous phase. The more the structure difference is, the more the value of effective activation energy for crystallization is. The effective activation energy for  $Zr_{60}Al_{15}Ni_{25}$  alloy is as high as 345 kJ/mol. Only as the primary phases are the same during the quenching of a high-temperature melt and the crystallization of corresponding amorphous alloy, can the kinetics parameters actually reflect the glass forming ability of the alloy, while it does not work conversely.

**Key words:** amorphous alloys; crystallization kinetics; primary phase; glass forming ability

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