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论文

机械合金化形成的Fe-Cu纳米晶过饱和固溶体的硬化及软化

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摘要： 用机械合金化方法，在不互溶的Fe－Cu二元系的富Fe端和富Cu端，分别制备出bcc和fcc结构的纳米晶过饱和固溶体，用X射线衍射和显微硬度分析等方法，系统研究了晶粒尺寸、溶质原子含量等因素对Fe－Cu纳米晶过饱和固溶体硬度的影响，结果表明，在富Cu端形成的fcc纳米晶过饱和固溶体的硬度，随溶质原子Fe含量的增加而升高，而在富Fe端形成的bcc纳米晶过饱和固溶体的硬度，随溶质原子Cu含量的增加而下降，根据纳米晶过饱和固溶体的结构特点，初步认为上述强化和软化可能是由于晶内和晶界发生了强化和软化所致。

关键词： 机械合金化 纳米晶材料 过饱和固溶体 Fe－Cu二元系

HARDENNING AND SOFTENNING EFFECTS OF Fe-Cu NANOCRYSTALLINE SUPERSATURATED SOLID SOLUTION FORMED BY MECHANICAL ALLOYING

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Abstract: In present work nanocrystalline supersaturated solid solutions (NSSS) with bcc and fcc structures were prepared in Fe-rich and Curich compostion of immiscible Fe-Cu system respectively by mechanical alloying. The effects of grain size and composition on the hardness of Fe-Cu NSSS have been studied by X-ray diffraction and Vickers hardness measurement. It has been found that the hardness of NSSS formed in Cu-rich composition increases with the increase of Fe, its solute atom content. On the contrary, the hardness of NSSS formed in Fe-rich composition decreases with the increase in Cu content.The hardenning and softenning caused by the dissolving of Fe and Cu respectively have been discussed based on the structure feature of NSSS and estimation of the strength of grain boundary and crystal components of NSSS.

Keywords: mechanical alloying nanocrystalline materials supersaturated solid solution Fe-Cu binary system

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