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机械合金化法制备不同Cr含量的W-Cr纳米合金粉末

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摘 要：采用机械合金化法制备Cr含量为8%、12.5%、20%(质量分数)的纳米W-Cr合金粉，对不同球磨时间粉末进行X射线衍射分析，以确定物相、晶粒尺寸及微应变，并采用扫描电子显微镜观察粉末形貌及粒度的变化。结果表明，采用机械合金化法可以制备不同Cr含量的纳米W-Cr合金粉。随着Cr含量的增加，制备纳米W-Cr合金粉所需球磨时间越长，其中W-8%Cr、W-12.5%Cr和W-20%Cr粉末的最佳球磨时间分别为72、84和96 h，晶粒尺寸小于30 nm。随着球磨时间的增加，晶粒尺寸不断减小，微应变逐渐增加，使常温下Cr在W中的固溶度增加，形成W的过饱和固溶体。Cr含量不同的W-Cr粉末完全合金化均经过4个阶段。

关键字： WCr合金粉末；机械合金化；Cr含量

Preparation of W-Cr nano alloying powders with different Cr contents by mechanical alloying

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Abstract: Abstract: The W-Cr nano alloying powders with the composition of W-8%Cr, W-12.5%Cr and W-20%Cr (mass fraction) were prepared by mechanical alloying. The phase structure, grain size and micro-strain of the powders were determined using X-ray diffractometry. The morphology and particle size of the powders were observed and analyzed by scanning electron microscopy. The results show that the W-Cr nano alloying powders can be obtained by mechanical alloying. With the increase of Cr content, the ball milling time should be prolonged in order to get W-Cr alloying powders. The optimum time of ball milling for W-8%Cr, W-12.5%Cr and W-20%Cr powders is 72, 84 and 96 h, respectively. Grain size of the powders is less than 30 nm. With the time of ball milling increasing, the particle size becomes smaller; the extent of micro-strain and distortion of lattice are intensified; and the solution limitation of Cr in W is enlarged. The super-saturated solid solution of W is obtained finally. Although the content of Cr and the time of ball milling are different, the change of W-Cr alloying powders undergoes four stages.

Key words: W-Cr alloying powders; mechanical alloying; Cr content

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