

### 论文摘要

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## 纳米TiO<sub>2</sub>对Mg<sub>2</sub>Ni<sub>0.75</sub>Cr<sub>0.25</sub>合金储氢动力学性能的改善

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**摘要:** 采用扩散烧结法制备了Mg<sub>2</sub>Ni<sub>0.75</sub>Cr<sub>0.25</sub>合金, 然后与纳米TiO<sub>2</sub>颗粒混合球磨得到纳米复合材料。X射线衍射分析结果表明, 纳米复合材料由Mg<sub>2</sub>Ni-Ni复相合金和纳米TiO<sub>2</sub>组成, 平均晶粒度为24~35nm。纳米TiO<sub>2</sub>颗粒对Mg<sub>2</sub>Ni<sub>0.75</sub>Cr<sub>0.25</sub>合金储氢动力学性能的提高具有催化作用, 降低了Mg<sub>2</sub>Ni<sub>0.75</sub>Cr<sub>0.25</sub>合金的吸、放氢温度, 使纳米复合材料氢化生成焓明显降低。对纳米复合材料的储氢性能测试结果表明: 添加1.5% (质量分数) TiO<sub>2</sub>的纳米复合材料在373K、4MPa下5min内完成吸氢, 并在463K、0.1MPa下20min内完成放氢, 最大放氢量为2.57%。

**关键字:** 储氢性能; 纳米复合材料; Mg<sub>2</sub>Ni合金; 纳米TiO<sub>2</sub>

## Improvement in hydrogen absorption and desorption kinetics of Mg<sub>2</sub>Ni<sub>0.75</sub>Cr<sub>0.25</sub> alloy by addition of TiO<sub>2</sub> nanoparticles

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**Abstract:** The nanocomposites were prepared by ball-milling Mg<sub>2</sub>Ni<sub>0.75</sub>Cr<sub>0.25</sub> alloy fabricated with different mass fractions (0.5%, 1.5%, 2.5%) of TiO<sub>2</sub> nanoparticles. The XRD patterns indicate that the nanocomposites contain Mg<sub>2</sub>Ni-Ni alloys and TiO<sub>2</sub> nanoparticles, and the average crystalline sizes are 24~35nm. The TiO<sub>2</sub> nanoparticles can act as catalyst and the nanocomposites show rapid absorption and desorption kinetics, and the absorption and desorption temperatures are greatly decreased. The value of absorption enthalpy for hydride formation of the nanocomposite is decreased as compared with nanocrystalline Mg<sub>2</sub>Ni<sub>0.75</sub>Cr<sub>0.25</sub> alloy. The absorption of the nanocomposite containing 1.5% TiO<sub>2</sub> nanoparticles is almost finished within 5min at 373K under the hydrogen pressure of 4MPa, and desorption is almost finished within 20min at 463K

under the hydrogen pressure of 0.1MPa. The nanocomposite gives the hydrogen content of 2.57% under the condition.

**Key words:** hydrogen storage properties; nanocomposites;  
Mg<sub>2</sub>Ni alloy; TiO<sub>2</sub> nanoparticle

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