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研究报告

Ti-Mo合金氢化物放氢动力学同位素效应研究

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摘要 在高真空金属系统中,采用非零初压热解析方法研究了钛钼合金TiMox（x=0.03, 0.13, 0.25, 0.50, 1.00, 原子比）氘化物的热解析动力学,测试了氘解析量c随时间t的变化关系，应用反应速率分析方法得到了热解析速率常数kd和热解析表观活化能Ed，合金氘化物Ed依次为46.6, 22.4, 13.7, 17.1, 10.4kJ.mol-1。比较氕化物的热解析动力学行为，Mo含量小于0.03时，合金氕化物Ed小于氘合金化物Ed，与钛放氢动力学同位素效应保持一致。Mo含量在0.13～0.25时，氕化物Ed大于氘化物Ed，Mo含量大于0.50时，氕，氘化物Ed 差别不大。通过初始解析时合金中氕，氘含量的比较，结合室温下合金吸氕，氘量，对合金放氢动力学同位素效应的本质进行了探讨。

关键词 Ti-Mo合金 氘化物 放氢动力学 同位素效应

分类号

The Kinetic Isotope Effect On Thermal Desorption Of Ti-Mo Alloy Hydrides

Abstract The desorption kinetics of TiMox alloy deuterides with different Mo contents (x=0.03, 0.13, 0.25, 0.50, 1.00, atomic ratio) were studied in an ultra-high vacuum system by applying the constant volume method. The rate constant of desorption, kd, is calculated by first-order rate analysis; and the desorption activation energy, Ed, is obtained from the relationship lnkd vs 1000/T , and Ed is 46.6, 22.4, 13.7, 17.1, 10.4kJ.mol-1, respectively. To investigate the kinetic isotope effect of Ti-Mo alloy hydrides, Ed of the alloy protides is compared. When the Mo content is lower than 0.03, the activation energy for deuterium desorption is larger than the activation energy for protium desorption. When the Mo content is between 0.13 and 0.25, Ed for protium desorption is larger than Ed for deuterium desorption. And the Mo content is larger than 0.50, the kinetic isotope effect is not obvious. The nature of the kinetic isotope effect is explored through the stability of deuterides and protides at various temperatures.

Key words Ti-Mo alloys deuteride desorption kinetics isotope effect

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