

反应堆工程

## 充氚不锈钢中氦行为的PAL和TEM研究

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**摘要** 对充氚和未充氚的抗氢-2(HR-2)不锈钢样品进行退火处理, 利用正电子湮没寿命谱(PAL)以及透射电镜(TEM)等技术探讨不锈钢中氦和微缺陷的相互作用。未充氚样品中, 退火温度对缺陷态的影响主要表现为偏聚物在晶界的析出。充氚样品实验中, 退火温度小于300 °C时, 充氚不锈钢中的He原子主要通过自捕获机制在晶内缺陷处聚集成泡; 热处理温度为300~600 °C时, 充氚不锈钢中的He原子主要通过热迁移的方式迁移至晶界导致晶界宽化, 但晶界处无明显的He泡形成; 热处理温度大于600 °C时, 热平衡空位开始发挥作用, 与聚集在晶内缺陷处的He原子结合形成He泡, 且随退火温度的升高, He泡有明显聚合长大的现象。

**关键词** [充氚不锈钢](#) [退火热处理](#) [氦](#) [正电子湮没寿命谱](#) [透射电镜](#)

分类号

## PAL and TEM Study of Helium in HR-2 Stainless Steel Charging With Tritium

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**Abstract** Positron annihilation lifetime (PAL) and TEM were applied for the tritium charged HR-2 stainless steel to investigate the interaction between He and defects under heating process. For the samples without tritium, the results of PAL and TEM indicate that heating process induces the precipitates to form on the grain boundaries. For the tritium charged samples, when the temperature is less 300 °C, He bubbles form by self-trappings, when the temperature is in the range of 300-600 °C, He atoms which migrate to the grain boundary make boundary wider, on which no He bubbles are observed; when the temperature is more 600 °C, thermal equilibrium vacancy becomes activity and combines with He atoms to form He bubbles which seem to combine and grow up with the increase of temperature.

**Key words** [stainless steel charging with tritium](#) [heating process](#) [He](#) [positron annihilation lifetime](#) [TEM](#)

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