

反应堆工程

UO₂粉末低温氧化表面改性研究

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摘要 本工作研究探索UO₂粉末的低温预氧化工艺。分别以10和20 °C/min的升温速度, 将UO₂粉末于流动空气中加热至900 °C进行热分析, 试验观测到第1个放热峰温度为224.6和239.7 °C, 第2个放热峰温度为367.0和381.7 °C。采用X射线衍射法分析了UO₂粉末于240、382和815 °C下氧化保温8 h后超化学计量铀氧化物UO_{2+x}的物相组成。结果表明: UO₂粉末在100~120 °C下失去吸附水; 在240 °C氧化8 h后, 有极少量的U₃O₇生成, 382和815 °C下氧化8 h后有U₃O₈生成。欲实现UO₂低温烧结, 获得2.25的最佳O/U原子比, 可将UO₂粉末预氧化工艺温度控制在240~370 °C之间。

关键词 [UO₂](#); [表面氧化](#); [热分析](#); [结构](#); [低温烧结](#)

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Surface Modification of Uranium Dioxide Powder by Low Temperature Pre-oxidation

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Abstract The pre-oxidation process of low temperature sintering of UO₂ powder was studied. UO₂ powder exposed to flowing air is heated from room temperature to 900 °C with 10 or 20 °C/min, respectively. The result shows that the first exothermic peak temperature is 224.6 and 239.7 °C, the second exothermic peak temperature is 367.0 and 381.7 °C. And then UO₂ powder was oxidized at 240, 382 and 815 °C for 8 h, respectively. The phases of oxidized powders were analyzed by XRD. It demonstrates that the UO₂ powder loses planar water between 100 and 120 °C approximately. A small quantity of U₃O₇ forms when the UO₂ powder is kept in furnace at 240 °C for 8 h, while U₃O₈ forms when the UO₂ powder is kept in furnace at 382 or 815 °C respectively for 8 h. In order to obtain 2.25 O/U atom ratio that is suitable to low temperature sintering of UO₂ pellet, the temperature for pre-oxidation process of UO₂ powder should be limited between 240 and 370 °C.

Key words [uranium dioxide](#) _ [surface oxidation](#) _ [thermal analysis](#) _ [structure](#) _ [low temperature sintering](#)

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