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反应堆工程

快堆金属燃料的发展

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摘要 国外早期快堆发展的燃料集中在金属燃料上，但金属燃料辐照肿胀严重，只能实现较低的燃耗深度，且较低的固相线温度和与包壳间的共晶温度又制约了金属燃料的实际应用。文章回顾国外金属燃料的发展和主要问题的解决方法，并总结金属燃料改进后可行的设计方案。随后整理早期、后期金属燃料的辐照经验，给出已验证的最大燃耗深度。

关键词 快堆 金属燃料 燃耗深度 肿胀 固相线温度 共晶温度

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Development of Metallic Fuel for Fast Reactor

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Abstract Most fuel types of the earliest fast breeder reactors were focused on metallic fuels composed of U, Pu or U-Pu alloys. Experiences in-core indicate that the swelling of metallic fuels is so severe that the cladding begins to fail at a low burnup, moreover the solidus temperature of uranium or uranium-plutonium fuel and eutectic temperature with stainless steel cladding materials are low and made it impractical to use metallic fuels in a commercial reactor. The paper reviews development of metallic fuels of fast reactors and ways to solve main problems of it, and then gives the improved and feasible design options for metallic fuels. Meanwhile the early and later irradiation experiences of metallic fuels were summarized, including the limits of burnup which had been demonstrated.

Key words fast reactor metallic fuel burnup swelling solidus temperature eutectic temperature

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