反应堆工程

研究堆燃料的发展现状与前景

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摘要   在过去33年中，国际降低研究和试验堆铀浓度计划已成功开发和应用了U_3Si_2-Al弥散型燃料。但由于U_3Si_2的抗辐照性能限制了它可能承受的运行温度与裂变密度，所以该燃料只适用于低功率密度的研究堆。U7Mo-Al弥散型燃料中的UMo颗粒与Al基体发生广泛的化学反应，将引起严重的肿胀与起泡问题。近年来，给U7Mo颗粒表面涂敷ZrN隔离层，获得防止反应的显著效果，使U7Mo-Al弥散型燃料有望应用于实践。U10Mo单片型燃料的芯体铀密度可达16 g/cm^3，辐照性能良好，但制造方法需进一步完善；应用中国核动力研究设计院改进的框架结构与轧制方法，能够控制UMo芯体与Al包壳具有相近的延伸率，从而可成功地轧制出合格的U10Mo合金单片型燃料板。

关键词   研究堆   燃料元件 U_3Si_2-   UMo合金

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Status and Prospect of Fuel Development for Research Reactors

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Abstract In past 33 years, U_3Si_2-Al dispersion fuel has been developed and is used successfully for RERTR program. But it is only suited to the research reactor with low power density, because the breaking swelling will occur during its operation temperature and fission density going beyond the bounds of the irradiation performance. The serious bubble growth and swelling of U7Mo-(Al, Si) dispersion fuel were caused by the chemical reaction between UMo particle and Al matrix. The ZrN coating on U7Mo particles can prevent their interaction, which is possible to use the U7Mo-Al dispersion fuel in the practical reactors. The monolithic U10Mo fuel plate has a uranium density of 16 g/cm^3 in this meat, and that has an excellent irradiation performance. They will be a kind of conspicuous high-class fuel in future. But the developing fabrication technique is required. It is possible the monolithic U10Mo fuel plate may be fabricated by using our improved frame structure and rolling method so as to maintain a similar percentage elon-gation of between UMo meat and Al cladding during rolling.

Key words   research   reactors   fuel   element U_3Si_2-   UMo   alloy

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