

Uranium diboride, the potential candidates of ATF, feature and application

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Abstract

It is universally acknowledged that power generation is most fundamental facility required by every industry, as almost all things require electricity to work. Among all the methods of electricity generation, nuclear power always faces considerable scrutiny. Undoubtedly, nuclear power brings about feelings of fear and unknown horror, especially after the accidents at Fukushima and Chernobyl. Such concerns are not unreasonable, as people's fear of nuclear power is a good measure to prevent accidents from happening. However, Taiwan people are too afraid of using this technology, turns out the result is miss out the opportunity to improve our ecosystem and make it more environmentally friendly. In this research, I would put the focus on the potentially fuel, Uranium diboride (UB₂), an interesting fuel that nowadays are research to be an ATF candidate fuel. Its physical properties also make it suitable for use in GEN-IV reactors, which require high standards to reaction. All of these factors make UB₂ show on my eyes, and this research aims to explore its potential.

Keywords: ATF, Uranium diboride, GEN-IV reactors

1. Introduction

Uranium diboride is potentially material which on closely debating to be the next generation re-actors fuel, especially known as ATF. UB₂ have unique talent to play a important role in these future plan. ATF purpose almost seems like make increasing the reactors power up-rates, longer cycle lengths, improved performance due to lowered thermal gradients across the fuel pellet reduced stored energy in the core, and allow for increased coping time during accident scenarios.

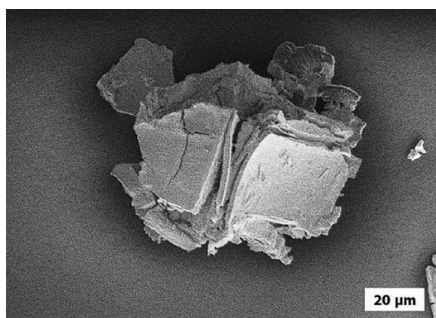


Figure 1: UB₂ Micrographs Picture[1]

2. The nuclear

Because this paper more like a class report than a real paper and not very rigorous, so before introduce and further more research UB₂, I liked to totally explain how the nuclear make our life so dramatic.

2.1. History

Recently, released film "Oppenheimer" has sparked interest in the nuclear industry. While primarily portraying atomic weapons, it has also piqued curiosity about peaceful nuclear applications. This increased interest can lead to exploring nuclear energy's potential in areas like energy, medicine, and agriculture. It's vital to use nuclear technology responsibly, addressing safety measures and waste management

3. Physical properties

In many candidate of ATFs material, the Uranium diboride has higher Uranium density than the others. Also, it has better thermal conductivity that make itself have lower fuel centre-line temperatures on working, result in many positive effect such like: reduce the rate of temperature-dependent release of fission products, reduce the energy stored inside the fuel (This properties also is the most important that the UB₂ need.)

References

- [1] J. K. Watkins, A. R. Wagner, A. Gonzales, B. J. Jaques, and E. S. Sooby, "Challenges and opportunities to alloyed and composite fuel architectures to mitigate high uranium density fuel oxidation: Uranium diboride and uranium carbide," *Journal of Nuclear Materials*, vol. 560, p. 153502, 2022. 1