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Plutonium Rock-Like Oxide fuel (ROXf) system , their once-through burning and usage.

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Abstract content
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The ROXf is a kind of inert matrix fuel U238-free matrices ,it has a high plutonium transmutation capability. The ROXf consists of chemically stable phases of fluorite 'stabilised ZrO₂ or ThO₂ and spinel MgAl₂O₄' . In this fuel , PuO₂ is solidified in a fluorite phase. With U238-Free matrices , a large part of the plutonium can be burned after irradiation in conventional LWRs. The spent ROXf consists of natural analogous geologically stable phases , and is disposed directly as high level wastes 'HLWs' after about 50 years cooling. From the high plutonium burn up rate and the high stability of the fuel, the ROXf-LWRs system has proliferation resistance and environmental safety. Characteristics of two types of ROXf , Zr-ROX and Th–ROX with weapons-Pu ,in an LWR core arrangement are evaluated by cell burn up calculations and 2-D core calculations using the SRAC code system and JENDL-3 nuclear library. In an LWR of moderator to fuel volume ratio = 1.9 , which corresponds to current PWRs , Pu transmutation rates with the two types of ROXf are large enough and more than 80% and 99% of Pu and Pu239 , respectively, can be burned. The calculated kinetic parameters indicate less moderate characteristics of ROX cores , especially with Zr-ROX .The fertile Th232 in Th-ROX works like U238 in the UO₂ fuel ,making kinetic parameters more moderate and reactivity drop due to burn up smaller than that Zr-ROX. The neutron capture of Th232 to generate U233 , causes the safeguards problem. Thus , the characteristics of Zr-ROX as a typical example , were investigated in this study.

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