

MATERIALS SCIENCE

Premium Edit

Pyrochlore is a mineral that preferentially preferably incorporates large amounts of Pu, U (up to 30 wt%wt), and ThoriumTh (up to 9 wt%wt.) into its structure [1-4].

~~Pyrochlores structure is the primary consideration as immobilization barriers for utilization of excess weapons-grade plutonium and other radioactive elements [5-7].~~

Pyrochlores existexists in nature as largehuge polyhedra with coordination numbers ranging from 7 to-8; this which makes them capable of accommodatingheld a wide range variety of radio-nuclides such as (e.g., Pu, U, Ba, and Sr, etc.), as well as neutron poisonsposition, such as (e.g., Hf and , Gd) [8]. As a

result, the pyrochlore structure is the primary consideration as immobilization barriers for utilization of excess weapons-grade Pu and other radioactive elements [5-7]. OwingDue to their their high radiation tolerance, pyrochlores are, these are largely used as combined inert matrix fuel forms and waste forms for the “burning” and final disposaldisposing of the major actinide Pu and the minor actinides [8].

Rare earth (RE) titanate pyrochlores ($RE_2Ti_2O_7$, where RE = Sm-Lu, or Y) have potential applications asAs solid electrolytes and mixed ionic/electronic conducting electrodes [9], catalysts [5], and ferroelectric/dielectric device components [11-13]. Rare Earth (RE, also known an lanthanides) titanate pyrochlore ($RE_2Ti_2O_7$, where RE = Lu-Sm, or Y) could be adopted.

Comment [A1]: An element name and the corresponding symbol are not to be treated as an abbreviation and its spelled-out form. Either the name or the symbol can be used consistently in the text; for example, silicon is referred to by its name or its symbol Si, but not as "silicon (Si)."

Comment [A2]: I have shifted this sentence to after the next sentence, since it is logical to first present all the characteristics of pyrochlores before mentioning the applications that these characteristics enable.

Comment [A3]: I have used "poison" assuming that you mean a substance with a large neutron absorption cross-section.

Comment [A4]: The meaning of this part of the sentence is not entirely clear. Do you mean “is the prime candidate for use as a barrier for the immobilization of excess weapons-grade Pu and other radioactive elements”?

Comment [A5]: Do you mean “both inert matrix fuel forms and waste forms” or “a combination of inert matrix fuel forms and waste forms”? Please revise accordingly.

Comment [A6]: I have added this phrase since the next part of the sentence mentions minor actinides.

Comment [A7]: Please consider providing a few examples of the minor actinides being referred to here.

Comment [A8]: I have made this change because “Sm to Lu” would be the correct logical order in terms of the atomic numbers of the elements in this range.

Comment [A9]: Academic publications following the Vancouver system of citations usually require the in-text citations to be included in numerical order. Please check this and include the citation of reference 10 before reference 11 here, or renumber the references to maintain numerical order.