

Rare-Earth Molecular Cluster Aggregates with Sandglass-like Core Topology as Surrogates for Minor Actinides in Immobilization within Alkaline-Earth Manganites

Autorzy

Rafał Petrus

Adrian Kowaliński

Tadeusz Lis

Miłosz Siczek

Piotr Sobota

Rok wydania

2025

Czasopismo

Inorganic Chemistry

Numer woluminu

64

Strony

16020-16035

DOI

10.1021/acs.inorgchem.5c02206

Kolekcja

Naukowa

Język

Angielski

Typ publikacji

Artykuł

Streszczenie

In this study, a series of rare-earth molecular cluster aggregates with the formula $[M_9^{RE}(\mu_4-OH)_2(\mu_3-OH)_8(sal-R)_{16}]X$ ($M^{RE(III)} = Y$ (**1**), Eu (**2**), Dy (**3**), Tm (**4**), Yb (**5**), Lu (**6**); $X^- = Cl^-$ (**1–2**, **4–6**), or $DyCl_4^-$ (**3**); Hsal-R = alkyl salicylate with R = Me (**2**, **4–6**), Et (**3**), or Me and Et (**1**)) were synthesized via the direct reaction of rare-earth chlorides ($M^{RE}Cl_3$) with in situ generated lithium or zinc methyl salicylate salts in a ROH/tetrahydrofuran (THF) solution (ROH = MeOH, EtOH) under controlled moisture conditions. Complexes **1–6** were investigated as surrogates for minor actinides, with the aim of immobilizing these species in alkaline-earth manganites. The manganites were obtained by thermal decomposition of mixtures comprising either $[Ca(sal-Et)_2]_n$ (**7**) or $[Ba(sal-Et)_2(THF)]_n$ (**8**) with $[Mn_2(\mu-OMe)_2(sal-Me)_4]$ (**9**) at 850 or 1100 °C. Thermolysis of compounds **7** and **9** in the presence of 0.22 or 1.11 mol % **1–6** at 1100 °C yielded M^{RE} -doped $CaMnO_3$ as the major phase, with variable amounts of $CaMn_2O_4$. Under analogous conditions, decomposition of **8** and **9** produced $BaMnO_3:M^{RE(III)}$; transmission electron microscopy (TEM) also identified nanorod-like crystallites of $M^{RE}MnO_3$. Alkaline-earth manganites, prepared via the aryloxide route, effectively incorporate $M^{RE(III)}$ ions at the Ca(II)/Ba(II) sites.

Słowa kluczowe

Cluster chemistry, Ligands, Materials, Transition metals,
Transmission electron microscopy

Licencja otwartego dostępu

CC-BY

Licencja na prawach której można swobodnie kopiować, rozprowadzać, zmieniać i remiksować objęty prawem autorskim utwór (Utwór-przedmiot prawa autorskiego) pod warunkiem podania imienia i nazwiska autora utworu pierwotnego oraz źródła pochodzenia utworu.

Pełny tekst licencji:

<https://creativecommons.org/licenses/by/3.0/pl/legalcode>

Adres publiczny

<http://dx.doi.org/10.1021/acs.inorgchem.5c02206>

Strona internetowa wydawcy

<https://www.acs.org/content/acs/en.html>