Uniwersytet Wrocławski

Repozytorium

Plik pochodzi z repozytorium Wydziału Chemii Uniwersytetu Wrocławskiego

Heterometallic group 4–lanthanide oxo-alkoxide precursors for synthesis of binary oxide nanomaterials.

Autorzy

Rafał Petrus

Katarzyna Chomiak

Józef Utko

Alina Bieńko

Tadeusz Lis

Piotr Sobota

Rok wydania

2020

Czasopismo

Inorganic Chemistry

Numer woluminu

59

Strony

16545-16556

DOI

10.1021/acs.inorgchem.0c02478

Kolekcja

Naukowa

Język

Angielski

Typ publikacji

Artykuł

Streszczenie

In this study, an efficient procedure for the synthesis of uncommon group 4–lanthanide oxo-alkoxide derivatives was developed. Heterometallic clusters with the structures $[La_2Ti_4(\mu_4\text{-}O)_2(\mu_3\text{-}OEt)_2(\mu\text{-}OEt)_8(OEt)_6(Cl)_2(HOEt)_2]$ (**1**), $[La_2Zr_2(\mu_3\text{-}O)(\mu\text{-}OEt)_5(\mu\text{-}Cl)(OEt)_2(HOEt)_4(Cl)_4]_n$ (**2**), $[La_2Hf_2(\mu_3\text{-}O)(\mu\text{-}OEt)_5(\mu\text{-}Cl)(OEt)_2(HOEt)_4(Cl)_4]_n$ (**3**), $[Nd_2Ti_4(\mu_4\text{-}O)_2(\mu_3\text{-}OEt)_2(\mu\text{-}OEt)_8(OEt)_6(HOEt)_2(Cl)_2]$ (**4**), $[Nd_4Zr_4(\mu_3\text{-}O)_2(\mu\text{-}OEt)_{10}(\mu\text{-}Cl)_4(OEt)_8(HOEt)_{10}(Cl)_2]$ (**5**), and $[Nd_4Hf_4(\mu_3\text{-}O)_2(\mu\text{-}OEt)_{10}(\mu\text{-}Cl)_4(OEt)_8(HOEt)_{10}(Cl)_2]$ (**6**) were synthesized via the reaction of a metallocene dichloride, $Cp_2M'Cl_2$ (where M′ = Ti, Zr, and Hf), and metallic lanthanum or neodymium in the presence of excess ethanol. This procedure gave crystalline precursors with molecular stoichiometries suitable for obtaining group 4–lanthanide oxide materials. Compounds **1**–**6** were examined by analytical and spectroscopic techniques and single-crystal X-ray diffraction. The magnetic properties of **5** and **6** were investigated by using direct and alternating current (dc and ac) susceptibility measurements. The results indicated weak antiferromagnetic interactions between Nd^{III} ions and a field-supported slow magnetic relaxation. Lanthanum–titanium compound **1** decomposed at 950 °C to give the perovskite compound $La_{0.66}TiO_3$ and small amounts of rutile TiO_2. Under the same conditions, **4** decomposed to give a mixture of $Nd_4Ti_9O_{24}$ and $Nd_{0.66}TiO_3$. When **4** was calcined at 1300 °C, decomposition of $Nd_4Ti_9O_{24}$ to $Nd_{0.66}TiO_3$ and TiO_2 was observed. Calcination of **2**, **3**, **5**, and **6** at 950–1500 °C led to the selective formation of heterometallic $La_2Zr_2O_7$, $La_2Hf_2O_7$, $Nd_2Zr_2O_7$, and $Nd_2Hf_2O_7$ phases, respectively.

Słowa kluczowe

Physical and chemical processes, Oxides, Mathematical methods, Materials, Ions

Adres publiczny

http://dx.doi.org/10.1021/acs.inorgchem.0c02478

Strona internetowa wydawcy

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

Plik został wygenerowany dnia 2026-11-02 18:44:59

Adres w repozytorium https://old.chem.uni.wroc.pl/pl/repozytorium/8fRYCDy.