

## Structural ordering studies of Nd<sup>3+</sup> ion in eulytite-type M<sub>3</sub>Y(PO<sub>4</sub>)<sub>3</sub> (M=Sr<sup>2+</sup> or Ba<sup>2+</sup>) phosphates. First translucent ceramics from micro-crystalline cubic powders

### Autorzy

Kacper Albin Prokop  
Miłosz Siczek  
Elżbieta Tomaszewicz  
Krzysztof Rola  
Yannick Guyot  
Georges Boulon  
Małgorzata Guzik

### Rok wydania

2024

### Czasopismo

Ceramics International

### Numer woluminu

50

### Strony

8042-8056

### DOI

10.1016/j.ceramint.2023.12.132

### Kolekcja

Naukowa

### Język

Angielski

### Typ publikacji

Artykuł

### Streszczenie

Cubic phosphates of M<sub>3</sub>Y(PO<sub>4</sub>)<sub>3</sub> (M=Sr<sup>2+</sup> or Ba<sup>2+</sup>) from the eulytite family were studied as potential candidates for new optical polycrystalline ceramics showing transparency. Two series of Nd<sup>3+</sup>-doped Ba<sub>3</sub>Y(PO<sub>4</sub>)<sub>3</sub> and Sr<sub>3</sub>Y(PO<sub>4</sub>)<sub>3</sub> micro-powders were synthesized *via* solid-state reaction method. The correlation between their structure and spectroscopic properties and the effect of divalent Sr<sup>2+</sup>/Ba<sup>2+</sup> cation creating a network was analyzed in detail. The crystal structure of Ba<sub>3</sub>Y(PO<sub>4</sub>)<sub>3</sub> and Sr<sub>3</sub>Y(PO<sub>4</sub>)<sub>3</sub> was solved *ab initio* based on their single crystals. Y<sup>3+</sup> and Sr<sup>2+</sup>/Ba<sup>2+</sup> ions do not share the same symmetry site and some slight distortion over crystallographic positions occupied by divalent and trivalent ions in the cationic sublattice was visible. Nd<sup>3+</sup> reside at the Y<sup>3+</sup> site but partial substitution of Ba<sup>2+</sup> or Sr<sup>2+</sup> cannot be excluded. The cationic and anionic disorder is reflected in spectroscopic properties. Nd<sup>3+</sup> ion used as a structural probe shows multisite character and inhomogeneous distribution in both types of material, as determined using absorption spectroscopy at 4.2K and laser-excited site-selective luminescence spectroscopy at 77K. This is also clearly seen in excited state dynamics of <sup>4</sup>F<sub>3/2</sub> doublet analysis. A greater order for barium host lattice was observed. Also, the first un-doped translucent ceramics were obtained from micro-crystalline powders.

### Adres publiczny

<http://dx.doi.org/10.1016/j.ceramint.2023.12.132>

### Strona internetowa wydawcy

<http://www.elsevier.com>

