

SiC single crystals, no magnetic signal was detected. We demonstrated that the intentionally created defects are responsible for the observed magnetism and deduced that carriers play an important role in defect-induced magnetism. Our results confirm the existence of defect-induced magnetism further and point out the necessary of tuning carrier to control the magnetism, providing some clues for tuning the magnetism of WBG semiconductors by defect engineering.

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The first rare-earth borophosphates

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In search for new compounds with new crystal structures and properties the exploration of the systems $MO_x-B_2O_3-P_2O_5-(H_2O)$ (MO_x = metal oxide) has been shown to be extremely successful [1]. Numerous compounds have been already synthesized with an amazing structural variety originating from the unique arrangement of isolated tetrahedra (BO_4 and PO_4) and trigonal planar units (BO_3) and/or the condensation between them by the formation of complex borophosphate anions. The synthesis conditions have been mainly optimized for early main-group and 3d transition elements up to now. Our recent synthetic efforts are focused on rare-earth elements, especially those with unpaired f electrons.

In the course of experiments on rare-earth elements (RE) the first hydrated borate phosphates with the general formula $K_3RE[OB(OH)_2]_2[HOPO_3]_2$ ($RE = Y, Yb, Lu$, space group: R-3) were obtained [2]. Isolated REO_6 octahedra are interconnected by PO_4 tetrahedra resulting in layers, which can be regarded as structural derivatives of the mineral Glaserite (Aphthitalite) [3], [4], $K_3Na(SO_4)_2$. Between two of these layers potassium ions and two layers of $OB(OH)_2$ units are intercalated.

Using a reactive flux synthesis method we succeeded in the preparation of a series of isostructural rare-earth borophosphates (space group $Pa-3$, $a = 13.6508(9)$ Å (Y) – $13.5490(7)$ Å (Lu)). The centers of isolated REO_6 octahedra form rhombic dodecahedra, which fill the space by sharing common faces. In each of these rhombic dodecahedral voids potassium ions and two tetrameric BP_3O_{13} units are located.

The borophosphate units are linked by a yet not fully characterized atom group. From the point of view of charge balancing the chemical formula the missing unit – named X – has to bear one positive charge. The residual electron density distribution between two neighboring BP_3O_{13} is characterized by a corrugated circle of 12 maxima ($d = 3.6$ Å) with a toroidal arrangement in the center. By taking into account the oxygen corners of the neighboring BO_4 tetrahedra, it can be assumed that the two oligomers are interconnected either by 1) a BO^+ - group (resulting in a BO_3 unit), 2) a $B(OH)_2^+$ - group (resulting in a $O_2B(OH)_2$ - tetrahedron), and 3) a PO_2^+ - unit (resulting in a PO_4 - tetrahedron). With this in mind and supporting information of thermal analyses, NMR, and chemical analyses, the chemical composition of the RE borophosphate is best described by $K_6RE[BP_3O_{13}(X^{1+})O_{13}P_3B]$, with $X^{1+} = BO, B(OH)_2$, and/or PO_2 , at the moment.

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An eu coordination polymer consolidated by 2,2'-biquinoline-4,4'-dicarboxylate

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Eu(III) chloride was allowed to reaction to sodium 2,2'-biquinoline-4,4'-dicarboxylate ($bqdc^{2-}$) lead to an Eu coordination polymer (**1**). X-ray analysis reveal that **1** crystallizes in triclinic, P-1 space group, $a = 11.122(1)$, $b = 11.938(1)$, $c = 14.184(2)$ Å, $\alpha = 74.869(2)$, $\beta = 76.480(2)$, $\gamma = 73.859(2)^\circ$, $V = 1719.8(4)$ Å³. **1** consists of an asymmetric unit of $\{[Eu_2(bqdc)_3(H_2O)_2(DMF)_2] \cdot 0.5DMF \cdot H_2O\}$, in which two of Eu atoms are equivalence, each is nine-coordinated with seven O atoms from five caboxy groups of bridging $bqdc^{2-}$ anions, and two O atoms from a DMF and a water molecules (Fig 1. a), forming a distorted monocapped square antiprism polyhedron, the distance between two neighboring Eu atoms is 4.108 Å. The metal ion is bridged by two types of $bqdc^{2-}$ anions to form a layer. The hydrogen bonds between the $bqdc^{2-}$ ligands and the lattice H_2O molecules connect the neighboring layers together into a 3D network (Fig 1. b). The stack of the layers results in channels along the c axis between neighboring layers.

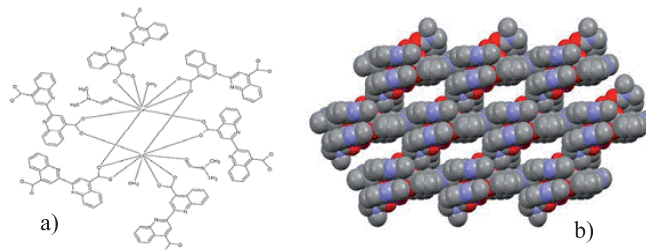


Figure 1. a). The coordination environment of Eu atom; b). Packing diagram of **1** viewed along the c axis showing channels. H atoms and the terminal and lattice DMF and H_2O molecules are omitted for clarity. Color scheme: Eu atoms, pink; C atoms, grey; O atoms, red; N atoms, blue.