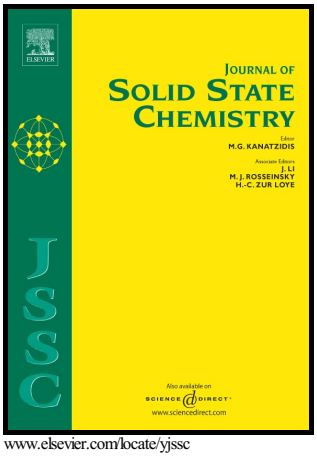

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Synthesis, crystal structure and physical properties of europium – manganese fluoride pnictides, EuMnPnF (Pn = P, As, Sb)

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The quaternary compounds EuMnPnF (Pn = P, As, Sb) have been prepared *via* solid state route at 1173K, and their crystal and electronic structures as well as magnetic and transport properties have been elucidated. These compounds belong to the widespread LaAgSO structure type and crystallize in tetragonal (*P*4/*nmm*) unit cells with a = 4.0292(1) Å, c = 8.9505(2) Å for EuMnPF, a = 4.1227(1) Å, c = 9.0846(2) Å for EuMnAsF, and a = 4.3120(1) Å, c = 9.4356(2) Å for EuMnSbF. At low temperatures, the magnetic response is dominated by Eu^{2+}. Contrary to previous reports, we do not observe any magnetic transitions in EuMnPF down to 2 K, whereas its arsenide and antimonide analogs exhibit Eu^{2+} ordering around 3 K. According to the electrical resistivity measurements and density-functional calculations, all three compounds are narrow-gap semiconductors.

Keywords: solid state synthesis; layered structures; electronic structure calculations; magnetic measurements; Eu compounds

Introduction

The quaternary equiatomic LaAgSO structure type [1] (fig. 1) along with its "twin" ZrSiCuAs arrangement [2 - 4] is rapidly developing and comprises over 200 representatives involving about 40 chemical elements. Its individual members exhibit intriguing functional properties [5 - 10], whereas chemical diversity opens broad perspectives for further materials design [11 - 13]. The LaAgSO structure can be considered as alternation of anti-isostructural