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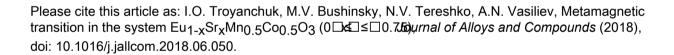
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### METAMAGNETIC TRANSITION IN THE SYSTEM $Eu_{1-x}Sr_xMn_{0.5}Co_{0.5}O_3$ ( $0 \le x \le 0.75$ )

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#### **ABSTRACT**

Magnetic properties of orthorhombic (space group Pnma) perovskite EuMn  $_{0.5}^{4+}$  Co  $_{0.5}^{2+}$  O<sub>3</sub> synthesized at various temperatures are studied up to 140 kOe. The sample obtained at 1500 °C shows a metamagnetic behavior irreversible below 40 K, whereas the sample obtained at 1200 °C exhibits purely ferromagnetic behavior. Both samples are ordered at Curie temperature  $T_C = 123$  K and reach equal magnetizations at high magnetic fields. The substitution of Eu<sup>3+</sup> by  $Sr^{2+}$  within  $Eu_{1-x}Sr_xMn_{0.5}Co_{0.5}O_3$  series of compounds leads to the increase in  $T_C$ , but the magnetization of these compositions strongly decreases and the metamagnetic transition disappears at x > 0.3. The composition with x = 0.75 is a cubic  $(Pm\bar{3}m)$  antiferromagnet with Neel temperature  $T_N \approx 210$  K. It is assumed that the metamagnetic transition is associated with a transition from a noncollinear into a collinear ferromagnetic phase. A noncollinear phase is formed due to the competition between positive  $Co^{2+} - Mn^{4+}$  and negative  $Mn^{4+} - Mn^{4+}$  and  $Co^{2+} - Co^{2+}$  superexchange interactions in the presence of large magnetic anisotropy. It is suggested that  $Sr^{2+}$  doping leads to formation of mixed high/low spin state of  $Co^{3+}$  ions and enforces antiferromagnetic component.

**Keywords:** Rare earth alloys and compounds, disordered systems, solid state reactions, exchange and superexchange, phase transitions, magnetic measurements.

#### INTRODUCTION

The rare-earth manganites RMnO<sub>3</sub> are of interest due to the colossal magnetoresistance effect found in derivatives of these compounds [1]. The ground state of these perovskites changes from antiferromagnetic to ferromagnetic one at substitution of either trivalent rare-earth ions R by divalent alkali earth ions Ca, Sr, Ba [2] or manganese ions by other transition metals ions, primarily Co or Ni [3].

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