The lattice and magnetic and electronic properties of the antiperovskite Mn_3XN (X=Zn, In, Sn) prepared under high pressure

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The antiperovskite $Mn_3XN(C)$ compounds have attracted great attentions due to their rich physical properties and important applications, such as superconductor, giant magnetoresistivity and negative thermal expansion, etc. The spin carriers and the interactions among the lattice, electronic and magnetic states play a critical role in the determination of the physical properties. However, many of the particular physical behaviors were very poorly understood. For example, whether structural change triggers magnetic phase transition or vice versa is still not clear. Moreover, many interesting physical properties need the deep exploration. Thus, it is worthy of our further study.

In this work, we synthesize the antiperovskite Mn_3XN (X=Zn, In, Sn) compounds under high pressure, determine their crystal structures, characterize their magnetic and electronic properties, and investigate the T-dependent lattice variation by variable temperature XRD. The results demonstrate that there is a close relation among lattice, spin, and charge in this kind of materials. For each sample, the magnetic transition always happens at certain temperature without change of the crystal structure. Sometimes, it is accompanied by the abnormal change of lattice constant and resistivity. However, these behaviors don't always take place according to the magnetic transition. What is the essence of the correlation? We will give detailed discussion in this presentation. The comparison of physical properties for the samples prepared under high pressure and common pressure will also be displayed.

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