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Insulating origin of the layered antiferromagnetic semiconductor (LaO)MnPn (Pn=P, As, Sb) KOICHI TAKASE, YASUHIRO MOROSAWA, TADATAKA WATANABE, YOSHIKI TAKANO, College of Science & Technology, Nihon University — The layered oxypnictides (LaO)MnPn are antiferromagnetic semiconductors. Considering a high spin magnetic state (s=5/2) of the Mn3d electrons, this system seems to be a Mott insulator. In this study, we have investigated the origin of an insulating character of (LaO)MnPn by carrier doping. The carrier doping is attempted by the fluorine substitution and deficient oxygen. Huge reductions of the absolute value of the electrical resistivity are found in all samples. Especially, the Sb system shows metallic characters in a highly doped concentration. If this system is a Mott insulator, the magnetic ordered phase should disappear in the metallic sample. However, ferromagnetic impurities increase with increase concentration and it hinders evaluation of the magnetic properties. From these results, these systems are robust against carrier doping. Only in the Sb system with relatively large Mn-Mn distances, the antiferromagnetic interaction is slightly weaker than those of P and As cases, the carrier doping might change the character from insulating to metallic. If this scenario is true, the origin of insulator should not be an usual band insulator but a Mott insulator.

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