

The Distortion of MnSe₆ Octahedron Enhances the Conductivity in Epitaxial MnSe Film.

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The observation of superconductivity in MnSe with onset temperature (T_c) near 5 K at applied pressure motivates us to investigate whether superconductivity is appeared in MnSe at ambient condition. In this report, we have grown a series MnSe films with different thickness by pulsed laser deposition (**PLD**) on (001) SrTiO₃ (**STO**) substrate, and study the lattice strain effect on MnSe. Although no superconducting behaviour is observed in this system, both the magnetic and transport properties in film apparently exhibit difference with bulk type. Especially, the resistivity of MnSe film is apparently lower than bulk type at room temperature, which might be the result of the effect of tensile lattice strain. The lattice structure of MnSe films are determined by four-circle diffractometer, and indicating the appearance of distortion of MnSe₆ octahedron in 32 nm film. Additionally, we perform x-ray absorption spectroscopy (**XAS**) to investigate the Mn valence and unoccupied states and compare that in the bulk and film-type MnSe. The results indicate the valence of bulk type is as same as MnO, but that is less than 2 in film type. Additionally, the unoccupied states in film type is systematic increase as the decrease of thickness, and these are apparently larger than bulk type. Therefore, we infer the mechanism of the promotion of conductivity in MnSe film is that the STO substrate provides the tensile lattice strain to distort the MnSe₆ octahedral structure in MnSe film.

Keywords - MnSe, epitaxial, distortion of octahedron, x-ray absorption spectroscopy