# Metal-insulator transition and two-dimensional electron liquid states in artificial structure of strongly correlated oxide

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Metal-insulator transition (MIT) is one of the most interesting phenomena in condensed matter physics. According to Mott-Hubbard theory, MIT can be controlled by the relative magnitude of on-site Coulomb repulsion $U$ and bandwidth $W$. Thus, in bulk materials, MIT is studied by the chemical substitution of constituent ions for ones with smaller ion radius, where $W$ is controlled by resultant changes in bond angle and bond length between transition metal and oxygen ions.

Another approach to bandwidth control is to use dimensional crossover in a thin film form. Since the decrease of layer thickness causes the reduction of effective coordination number in constituent ions, the resultant reduction of effective $W$ may drive MIT in the conductive transition metal oxides. In this study, we have adopted this approach to a typical $3d^1$ perovskite material $SrVO_3$ (SVO) that shows metallic behavior, and investigated how spectral function changes as a function of dimensionality using *in situ* photoemission spectroscopy (PES). In the PES spectra, thickness-dependent MIT is clearly observed with decreasing film thickness. This thickness dependent spectral behavior is in good agreement with the calculation results based on dynamical mean field theory, indicating that the observed MIT is caused by the reduction in magnitude of $W$ due to the dimensional crossover.

These results suggest the possible creation of two-dimensional electron liquid (2DEL) states in the ultrathin film of SVO. Recently, we have performed angle-resolved PES on the SVO ultrathin film and obtained spectral evidence for the confinement of strongly correlated electron in the SVO ultrathin film [1]. The possible creation of 2DEL states using oxide artificial structures will be discussed.

[1] K. Yoshimatsu *et al*., Science **333**, 319 (2011).