

# 54th GREEN Open Seminar

2016 / 12 / 20 (Tue) 13 : 00 ~ 14 : 30

Venue : Seminar Room #409,410 (4F),  
Collaborative Research Bldg., Namiki Site

## Oxidation Dynamics of Vanadium Thin Film via Ambient Pressure XPS

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### Abstract

As its oxidation states vary, vanadium oxides display dynamic physical and chemical characteristics. Most well-known case is  $\text{VO}_2$  ( $\text{V}^{4+}$ ), exhibiting dramatic metal-insulator transition near room temperature, i.e.  $\sim 340$  K. While many research groups have made the efforts to utilize the characteristics of vanadium oxides in industrial applications, the fabrication process of high-quality vanadium oxides has not been clearly identified, as the oxidation state of vanadium is extremely sensitive to the oxygen pressure and temperature during fabrication processes.

In this presentation, I will discuss how ambient pressure X-ray photoelectron spectroscopy (AP-XPS) can be applied to identify the ideal fabrication conditions of vanadium oxides, i.e. ideal oxygen pressure and temperature. With the application of AP-XPS, The evolution of oxidation/reduction states of vanadium oxide thin film are monitored *in-situ* as a function of oxygen pressure and temperature. As the pressure of oxygen gas and annealing temperature change, various oxidation states of vanadium are formed on surface. Upon the fabrication of  $\text{VO}_2$  oxide film, Raman spectroscopy and transport properties measurements are carried out to confirm the presence of  $\text{VO}_2$  formation. Interestingly, it is found that  $\text{VO}_2$  films can be fabricated at a much lower temperature, i.e. 523 K, than the conventional  $\text{VO}_2$  growth temperature,  $\sim 700$  K.