Chapter 6: Conclusions

We investigate an efficient strategy for obtaining the metal oxide nanodot arrays with anodic aluminum oxide as template. Anodic oxidation of Al on metal film has been performed in oxalic, sulfuric and phosphoric acid electrolytes at various applied voltages for porous alumina formation. Anodising reaction proceeds in the sequence of growth of porous anodic alumina when the aluminum layer is consumed up to the underlying metal, and the growth of tantalum oxide under the bottoms of the alumina pores occurred simultaneously. In oxalic and sulfuric acid specimen, the diameter of tantalum oxide nanodot demonstrated here ranges between 10nm ~ 200nm and density ranges between $10^{11}/cm^2$ ~ $10^9/cm^2$. In addition, the diameter and density of the nanodot can be controlled by various applied voltages. SEM and XPS were used to determine the microstructure and chemical composition of the nanodots. The nanodots are composed of nonstoichiometric TaO_x. The tantalum oxide nano-pyramid arrays were fabricated under phosphoric acid specimen. Moreover, zinc oxide nanodot arrays were also fabricated by this novel strategy. Using this approach, it is expected that nanodot arrays of various oxide semiconductors can be achieved. The controllable self-organization process of forming the nanodots offers a simple and inexpensive way to fabricate a variety of low dimensional and densified nanodot arrays on substrate over a large area.