IS-003 <Invited Talk>

Atomic Layer Deposition for Display Applications

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Atomic Layer Deposition (ALD) has remarkably developed in semiconductor and nano-structure applications since early 1990. Now, the advantages of ALD process are well-known as controlling atomic-level-thickness, manipulating atomic-level-composition control, and depositing impurity-free films uniformly. These unique properties may accelerate ALD related industries and applications in various functional thin film markets. On the other hand, one of big markets, Display industry, just starts to look at the potential to adopt ALD functional films in emerging display applications, such as transparent and flexible displays. Unlike conventional ALD process strategies (good quality films and stable precursors at high deposition processes), recently major display industries have suggested the following requirements: large area equipment, reasonable throughput, low temperature process, and cost-effective functional precursors. In this talk, it will be mentioned some demands of display industries for applying ALD processes and/or functional films, in terms of emerging display technologies. In fact, the AMOLED (active matrix organic light emitting diode) Television markets are just starting at early 2013. There are a few possibilities and needs to be developing for AMOLED, Flexible and transparent Display markets. Moreover, some basic results will be shown to specify ALD display applications, including transparent conduction oxide, oxide semiconductor, passivation and barrier films.

Keywords: Atomic Layer Depostion, Oxide Semiconductor, Transparent Conducting Oxide

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Precursor Chemistry for Atomic Layer Deposition

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Advanced electronic application areas have strongly required new materials due to the continuous shrinking dimensions of their devices. Specially, the development and use of metal precursors for atomic layer deposition has been extensively focused on application to electronic devices. Thus the systematic design and synthesis of metal compounds with relevant chemical and physical properties, such as stability, volatility, and resistance to air and moisture are very important in the vacuum deposition fields. In many case, organic ligands for metal precursors are especially focused in the related research areas because the large scale synthesis of the metal complexes with excellent properties exclusively depends on the potential usefulness of the ligands. It is recommended for metal complexes to be in monomeric forms because mononuclear complexes generally show high vapor pressures comparing with their oligomeric structure such as dimer and trimer. Simple metal alkoxides complexes are involatile except several examples such as Ti(OiPr)4, Si(OEt)4, and Hf(OtBu)4. Thus the coordinated atom of alkoxide ligands should be crowded in its own environment with some substituents by prohibiting the coordinated atoms from bonding to another metal through oxygen-bridging configuration. Alkoxide ligands containing donor-functionalized group such as amino and alkoxy which can induce the increasing of the coordinative saturation of the metal complexes and the decreasing of the intermolecular interaction between or among the metal compounds. In this presentation, we will discuss the development of metal compounds which adopted donor-functionalized alkoxide ligands derived from their alcohols for electronic application. Some recent results on ALD using metal precursors such as tin, nickel, ruthenium, and tungsten developed in our group will be disclosed.

Keywords: ALD, precursor, thin films, complex, volatility