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Atomically Smooth Epitaxial Al Films for UV Plasmonics PING-HSIANG SU, FEI CHENG, JUNHO CHOI, Department of Physics, University of Texas at Austin, SHANGJR GWO, Department of Physics, National Tsing-Hua University, XIAOQIN LI, CHIH-KANG SHIH, Department of Physics, University of Texas at Austin — Plasmonics is a science of manipulating light in the metal and dielectric interface. An atomically smooth epitaxial metal film is of particular importance in this field because it can significantly reduce plasmonic loss from inelastic scattering of electrons in the metal due to rough surface, crystal structure defects, and grain boundaries. Among available plasmonic metals, aluminum (Al) is of particular interest because it was demonstrated to be an excellent platform for ultraviolet (UV) plasmonics in recent years. However, Al is highly reactive with oxygen and can be rapidly oxidized once exposed to even a low partial pressure of oxygen (10^{-8} Torr). Therefore it will be a challenge to prepare a high-purity Al film with desired properties such as atomic smoothness and single crystallinity. In this talk I am going to report the successful growth of atomically smooth epitaxial Al films on Si(111) using a molecular beam epitaxy system. Based on the spectroscopic ellipsometry measurement, these epitaxial films show significant reduction in plasmonic loss up to a factor of two in the UV regime in comparison with the widely cited data compiled by Palik. As a result, they serve as an ideal platform for UV plasmonics.

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