

Electrical properties of molybdenum disulfide thin film grown by atomic layer deposition

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Recently MoS₂ has attracted great attention for electronic and catalyst applications. Here we report MoS₂ thin films grown by atomic layer deposition (ALD) using molybdenum hexacarbonyl and dimethyl disulfide as Mo and S precursors, respectively. The as-grown MoS₂ thin films are amorphous, because of the low growth temperature of 100°C. However, the films can be crystallized to have the layered structure parallel to the substrate by annealing at 900°C under Ar or H₂S atmosphere. Raman spectra of MoS₂ films show the typical Raman modes (E₁2g and A₁g) of 2H-MoS₂ with a trigonal prismatic arrangement of S-Mo-S. Electrical properties such as conductivity and activation energy for conduction are characterized, and its diode performance is discussed on a heterojunction of n-MoS₂/p-Si structure.