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Structural characterizations of sputtered nanocrystalline TiN films for electrodes of AMTEC systems M.G. HAN, S.-Y. CHUN, Mokpo National University — TiN films have been widely used in the tooling industry as a wear resistant coating due to the high hardness and high wear resistance for many years. Recently, TiN films were also used as an important electrode material for the design of alkali metal thermal-to-electric conversion (AMTEC) system due to its excellent electrical conductivity and excellent adhesion layer performance. The control of microstructural characteristics such as grain size, shape, textures, porosity, density, and packing factor are vital for ensuring the reliability of TiN films in structural and functional applications. Nanocrystalline TiN thin films were deposited on Si(100) substrates under various bias voltages have been prepared by a reactive magnetron sputtering. The effect of bias voltage on the microstructural morphologies of the TiN films was characterized by FE-SEM and AFM. The crystallographic texture of the TiN films was characterized by XRD. The films deposited under an Ar + N_2 atmosphere exhibited a mixed (200)-(111) orientation with a strong (200) texture, which subsequently changed to a strong (111) texture with increasing bias voltage. It is also observed that the crystallite size decreases with increasing bias voltage, which corresponds to the increasing diffraction peak width of XRD patterns. The changes in texture and crystallite size in the TiN thin films are due to one or a combination of factors such as strain energy, surface free energy, surface diffusivity and adatom mobility; the influence of each factor depends on the processing conditions.

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