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Room-Temperature Deposition of Silicon Nitride Films with Very High Rates Using Atmospheric-Pressure Plasma Chemical Vapor Deposition HIROAKI KAKIUCHI, HIROMASA OHMI, KIYOSHI YASUTAKE, Osaka University — We have investigated the structure and stability of SiN_x films deposited with very high rates (>50 nm/s) in atmospheric-pressure (AP) He-based plasma excited by a 150 MHz very high-frequency (VHF) power using a cylindrical rotary electrode at room temperature. The SiN_x films are prepared on Si(001) substrates with varying VHF power density (P_{VHF}), H_2 concentration and source ratio (NH_3/SiH_4). The results show that increasing H_2 concentration under the supply of a moderately large P_{VHF}, together with the adjustment of NH_3/SiH_4 ratio, enables us to prepare SiN_x showing reasonable stability against a buffered hydrofluoric acid solution in spite of the very high deposition rate of 130 nm/s. The achievement of such a high-rate deposition at room temperature is primarily due to the significant enhancement of both gas-phase and surface-phase reactions in AP-VHF plasma.

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