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Growth of Amorphous Silicon Nitride Films on Silicon Wafer by Atmospheric Pressure Plasma Jet[1] XUEQIANG ZHANG, Radiation Laboratory & Department of Chemistry and Biochemistry, University of Notre Dame, SYLWIA PTASINSKA, Radiation Laboratory & Department of Physics, University of Notre Dame — Atmospheric pressure plasma jets (APPJ) possess favorable advantages including low temperature, low cost and the potential to be applied in areas such as coating and material functionalization. Silicon nitride is the most important non-oxide ceramics and multi-methods have been employed to grow silicon nitride, but its application has been limited by its high production cost. Here we demonstrate a method in which APPJ was used to grow amorphous silicon nitride films on a silicon wafer. Hydrofluoric acid pretreated Si wafers were treated by the helium APPJ at ambient air conditions. X-ray photoelectron spectroscopy (XPS) showed that silicon nitride species with binding energy at 398 eV are formed on the Si surface. XPS spectra taken from different areas of Si wafers indicate that the formation of nitrides is highly localized due to direct interactions with the plasma jet. This can also be verified by XPS 2-D mapping of N1s signal. Other gases such as N_2, N_2O, NO, NH_3 were doped into the helium stream and it was found that nitrogen and ammonia gas mixed with helium produced the highest intensity of a nitride signal. Optical emission spectra of APPJ were measured in order to understand the nitride formation mechanism.

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