Atmospheric-Pressure Plasma Oxidation Process for Passivation of Si Surface

ZE TENG ZHUO, TAKAYUKI OHNISHI, KAZUMA GOTO, YUTA SANNOMIYA, HIROMASA OHMI, HIROAKI KAKIUCHI, KIYOSHI YASUTAKE, Department of Precision Science and Technology, Graduate School of Engineering, Osaka University, 2-1 Yamada-oka, Suita, Osaka 565-0871, Japan — Surface passivation films on Si wafers have been prepared by atmospheric-pressure (AP) plasma oxidation technique. Optical emission spectroscopy of O$_2$/He AP plasma revealed that SiO$_2$ films were obtained at high oxidation rate under the condition with high O emission intensity. From the MOS CV measurements of obtained SiO$_2$/Si interface, the interface state density ($D_{it}$) and the fixed oxide charge density ($Q_f$) were in the range of $(4–20) \times 10^{10}$ cm$^{-2}$eV$^{-1}$ and $(5–20) \times 10^{11}$ cm$^{-2}$, respectively. According to the model calculation on surface recombination velocity ($S$) demonstrated that the obtained $Q_f$ was sufficient to significantly reduce $S$ for n-type Si with SiO$_2$ layer prepared by AP plasma oxidation.