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Pore Sealing vs. Surface Densification in Inhibition of O_2 Plasma Damage in Organosilicates[1] JEFFRY KELBER, SWAYAMBHU BEHERA, Dept. of Chemistry, University of North Texas, Denton, TX 76203 — XPS and FTIR were used to determine effects of surface densification vs. pore sealing on O_2 plasma-induced carbon loss from organosilicate glass (OSG). O_2 plasma exposure during photoresist removal induces carbon loss and increased dielectric constant in OSG. He plasma-induced SiO_2 formation (surface densification) is considered the chief damage inhibition mechanism. However, comparison of OSG pretreatments involving (a) direct He plasma, or (b) He plasma exposure in the presence of a MgF_2 window (He/MgF_2), indicates that UV-induced pore sealing in the OSG interior plays a dominant role in inhibition of carbon loss. He plasma pretreatment results in the formation of a $\sim$ 50 angstrom thick SiO_2 surface layer, whereas He/MgF_2 pretreatment–which transmits only UV results in $<$ 3 angstroms SiO_2 formation; yet both He plasma and He/MgF_2 pretreatments inhibit carbon loss at longer O_2 plasma exposure times. Results are consistent with findings concerning the role of O radical diffusion down nanopores in the carbon loss process, and O radical diffusion through SiO_2. UV radiation blocks interconnections between pores in OSG, inhibiting carbon loss.

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