

Electrical and Mechanical Properties of Ordered Mesoporous Silica Film with HMDS Treatment

Tae-Jung Ha, Sun Gyu Choi, A.Sivasankar Reddy, *Byoung-Gon Yu, Hyung-Ho Park
Yonsei Univ., *Electronics and Telecommunications Research Institute

Abstract : In order to reduce a signal delay in ULSI, low resistive metal and intermetal dielectric material of low dielectric constant are required. Ordered mesoporous silica film is proper to intermetal dielectric due to its low dielectric constant and superior mechanical properties. In this study, ordered mesoporous silica films was synthesized using TEOS (tetraethoxysilane) / MTES (methyltriethoxysilane) mixed silica precursor and Brij-76[®] surfactant. These films had the porosity of 40 % and dielectric constant of 2.5. To lower dielectric constant, the ordered mesoporous silica films were surface-modified by HMDS (hexamethyldisilazane) treatment. HMDS substituted -OH groups on the surface of silica wall for $-\text{Si}(\text{CH}_3)_3$ groups. After the HMDS treatment, ordered mesoporous silica films were calcined at various calcination temperatures. Through the investigation, it was concluded that the proper calcination temperature is necessary as aspects of structural, electrical, and mechanical properties.

Key Words : Ordered Mesoporous Silica Film, HMDS, Brij-76, Low-k