

## The study of post annealing effects on low dielectric constant SiOC films.

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We studied about the post annealing effects of electrical, mechanical, and chemical properties on low- $\kappa$  SiOC films deposited by plasma-enhanced chemical vapor deposition. For the memory applications, it has some advantages that the precursor has Si-OCH<sub>x</sub>CH<sub>y</sub> side chains sustaining harder films than previously reported low- $\kappa$  materials. The dielectric constant ( $\kappa$ -value) of the as-grown film was measured about 2.45 by MOS CV measurement at 100 kHz. In order to investigate the changes of properties in this film, we use a rapid thermal annealing (RTA) process in N<sub>2</sub> ambient at temperature range between 250 and 600 °C for 5 min. The chemical structures of annealed films were studied by reflection mode Fourier transform infrared (FTIR) spectroscopy. For the annealing temperature up to 500 °C, the  $\kappa$ -value has gradually decreased to 2.24 because of the formation of Si-O cage structure while the films maintained its mechanical properties such as hardness and modulus. For the film treated by RTA at 600 °C, the CH<sub>x</sub> groups of the film were released and Si-O network enhanced. Thus the film has  $\kappa$ -value of 4 and hardness of 4.5 GPa similar to the properties of silicon dioxide. In conclusion, the post annealing treatment on SiOC film has decreased the  $\kappa$  value about 8 %, while, for higher annealing temperature over 600 °C, the properties have hanged similar to the silicon dioxide film.

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