

## Fluorinated Silicon Oxide (SiOF) as a New Inter-metal Dielectric

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As ULSI devices are scaled down to ever smaller dimensions, the chip size is not getting smaller but actually increased for each device generation. As a result the RC delay due to the long interconnection length and the narrow interconnection line space is becoming the limiting factor in the high speed chip performance. It is now essential to reduce the interconnection RC delay in order to keep up the scaling trend.

The reduction of RC delay can be accomplished either by reducing the resistivity of conductor or by reducing the parasitic capacitance of the inter-metal dielectric (IMD). A low resistance conductor is effective on improving RC delay in global routing. On the other hand, a low dielectric film is effective in local routing and in global routing. So one of the most effective way is to use low dielectric constant materials for the inter-metal dielectric.

Recently, a Fluorinated Silicon Oxide (SiOF) film has been studied as the inter-metal dielectric film, because it has a low dielectric constant, an excellent gap filling property and a good planarization capability.

In this work, low dielectric SiOF films were deposited by the addition of  $\text{NF}_3$  gases as a fluorine source to  $\text{SiH}_4$  based PECVD and by the addition of  $\text{SF}_6$  gases to TEOS based RPCVD.

The effect of the fluorine doping on the dielectric constant, and the effect of fluorine source addition on the gap filling ability in sub-half micron interconnection were studied. Also, we investigated the local atomic structure of SiOF films by using FTIR and XPS. By the analysis on the dielectric films with various fluorine concentrations, the local atomic structure of the SiOF films are closely related to the decrease of the dielectric constant.