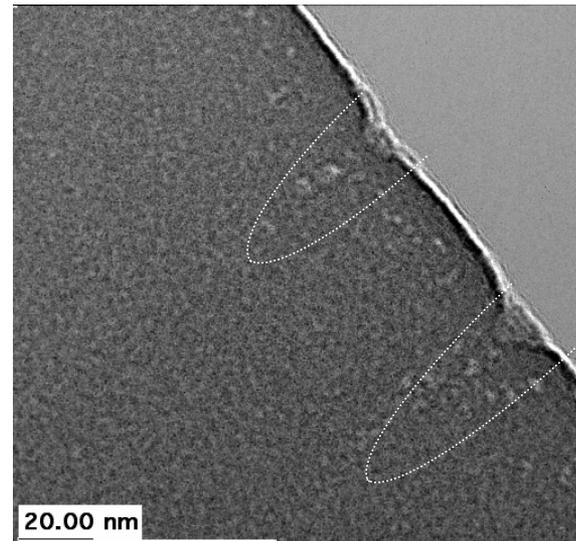


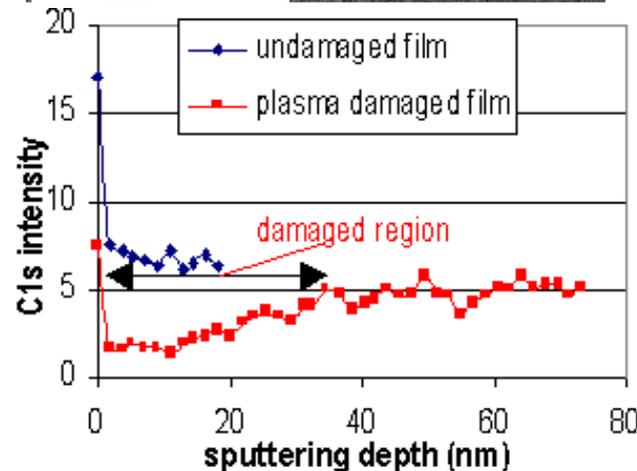
GOALI: Nanoscale Characterization and Development of Ultra Low-k Dielectric Xerogel Films

R.F. Reidy¹, M.J. Kim², D.W. Mueller¹, P.D. Matz³, ¹Univ. of North Texas, ²Univ. of Texas-Dallas, ³Texas Instruments, DMR #0316916

Demands for faster, smarter, and smaller electronic devices require the semiconductor industry to shrink features in integrated circuits. Future insulating layers will likely be porous to meet device requirements. Porosity renders the film vulnerable to damage from wet and plasma processing. Recent work has shown that while plasma damage is within 30-40 nm of the surface, it is localized within specific lateral regions. This was not known previously.



This transmission electron microscopy image shows porous methyl-functionalized silica film after exposure to an oxygen plasma. Note the damaged regions near the surface.



This x-ray photoelectron spectrum indicates a region of carbon loss (30-40 nm from the surface) resulting from the plasma treatment

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Education:

One undergraduate (Janet Trammell) and four graduate students (Rosa Orozco-Teran, Zhengping Zhang, Pawan Nerusu, Dongkyu Cha) have contributed to this work. Zhang completed his PhD and is working in the semiconductor industry. Orozco-Teran interned at Texas Instruments this summer and will complete her PhD in Fall 2004. Students regularly meet and discuss relevant project issues with our Texas Instruments liaison maintaining awareness of industrial priorities. During the of Summer 2004, three students from the Texas Academy of Mathematics and Science (TAMS), worked on this effort (one was supported by this grant and the others were supported by TAMS.

Outreach:

In addition to TAMS involvement, we will be proposing an RET addendum to this program. We hope to involve two local secondary science teachers in nanoscience research. This program will involve a special topics class to familiarize the teachers with nanoscience/nanotechnology the semester prior to the summer program. Further, a presentation by the teachers to their classes will be filmed and available to other interested educators.