

Abstract Submitted  
for the MAR09 Meeting of  
The American Physical Society

**Spectroscopic analysis of ALD-coated 3D structures and origin of the Berreman effect** GIOVANNA SCAREL, JEONG-SEOK NA, KEVIN HYDE, GREGORY PARSONS, North Carolina State University, PARSONS GROUP TEAM — The Berreman effect shed light on various phenomena in 2D systems. However, coatings of 3D systems in soft-lithography and photonic devices, or 3D fibers suggest that the Berreman effect in 3D structures could be different. Experimental and computational infrared spectroscopy studies of 3D structures conformally coated with  $\text{Al}_2\text{O}_3$  and ZnO layers using atomic layer deposition support this conclusion. In 2D systems, defining  $\theta_0$  the macroscopic incidence angle of the IR beam on a sample, the LO mode absorbance increases as  $[\text{Sin}(\theta_0)]^4$  when  $\theta_0$  becomes grazing. On the other hand, in 3D systems a linear combination of  $[\text{Sin}(\theta_0)]^4$  with appropriate coefficients must be considered. Accounting for Snell's law in the simulation model is essential to explain these results and the origin of the Berreman effect. We conclude that sample geometry determines infrared absorbance of LO modes versus  $\theta$  and vice-versa. Our results promise a new tool to investigate topography of insulating ionic oxide layers.

Giovanna Scarel  
North Carolina State University

Date submitted: 14 Nov 2008

Electronic form version 1.4