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Coherent Oscillations in Spoof-Like Plasmonic Ag deposited by PEALD RYAN COMPTON, Chemistry Division, Naval Research Laboratory, Washington, DC 20375, USA, NRC Postdoctoral Research Associate, SHARKA M. PROKES, OREST J. GLEMBOCKI, Electronic Science Division, Naval Research Laboratory, Washington, DC 20375, USA, JEFFREY C. OWRUTSKY, Chemistry Division, Naval Research Laboratory, Washington, DC 20375, USA — The spoof-like plasmonic properties of Ag thin films produced by plasma enhanced atomic layer deposition (PEALD) were investigated with static and transient spectroscopy. The PEALD process results in a film with cylindrical 2D structures separated by air gaps, giving rise to the plasmonic behavior. Films with thicknesses ranging from 10 to 32 nm were deposited and compared to films of similar thickness produced with traditional e-beam methods. Transmission spectra of the ALD films exhibit a strong surface plasmon resonance (SPR) band at approximately 700 nm, while the e-beam samples were devoid of band structure. The SPR band of the 10 nm ALD sample is blue-shifted (to 550 nm), suggesting morphological differences for the thinnest film. Transient absorption studies with a 400 nm probe revealed electron-phonon coupling times that are similar for both ALD and e-beam films. Transient measurements of the ALD Ag probed near the plasmon band (800 nm), however, feature coherent oscillations attributed to breathing of the cylindrical structures, whereas the e-beam films exhibit no oscillatory behavior. The oscillation period was found to be independent of ALD thickness, except in the 10 nm sample where no oscillations were observed.

Ryan Compton
Naval Research Lab

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