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Localized and Propagating Surface Plasmons in Aluminum Nanostructures: The Effect of Metal Deposition Method on Resonance Quality and Depolarization[1] VLADIMIR LIBERMAN, KENNETH DIEST, COREY STULL, MATTHEW COOK, DONNA LENNON, MORDECHAI ROTHSCHILD, MIT Lincoln Laboratory, STEFAN SCHOECHE, J. A. Woollam Co., Inc. — The field of plasmonics has provided revolutionary concepts in sensing, nanooptics and energy harvesting. Al plasmonics has recently emerged as an alternative, CMOS-compatible nanofabrication platform for applications in the UV-visible ranges. Previously, we found that high-temperature sputtered Al films showed significantly better plasmonic response than conventional evaporated films. Here, we extend this thin film work to patterned aluminum nanostructures that support both localized and propagating plasmon modes. The nanostructures from sputtered and evaporated aluminum are fabricated side-by-side in a CMOS compatible state-of-the-art facility. The quality of plasmonic resonances is analyzed with Mueller Matrix spectroscopic ellipsometry over a wide range of incidence angles and wavelengths. Full band structure is experimentally obtained and verified with full-field simulations. We find a strong enhancement in the ellipsometric depolarization parameter near the wavelengths of plasmonic resonance. The depolarization parameter is interpreted as a powerful connection between the near and the far field, providing a diagnostic of the quality of plasmonic resonances.

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