Abstract Submitted
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Plasmon response of a quantum-confined electron gas probed by core-level photoemission[1] MUSTAFA M. OZER, Oak Ridge National Laboratory, EUN JU MOON, ADOLFO G. EGUILUZ, HANNO H. WEITERING, University of Tennessee — The emergence of the "bulk" plasmon in *atomically-smooth* ultrathin Mg(0001) films on Si(111) has been determined using x-ray photoelectron spectroscopy (XPS). Plasmons in this quasi two-dimensional (2D) regime turn out to be excited primarily via the sudden creation of the core hole, as the extrinsic loss channel (which is dominant in bulk XPS spectra) is suppressed by electron confinement. The collective plasmon response of the films is remarkably similar to that of a thin slice of *bulk matter*, subject to quantum-size boundary conditions, in spite of the fact that the one-electron degrees of freedom are quantized. The energy-loss spectra of the thinnest films are characterized by a gradual transfer of spectral-weight from the bulk-like collective modes to the low-energy one-electron excitations, and the plasmon ultimately collapses below six monolayers. Our results represent striking manifestations of the role of electronic confinement on plasmon resonances in precisely-controlled nanostructures.

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Mustafa M. Ozer
Oak Ridge National Laboratory

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