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Plasmonic Coupling Effects in Large-area High-enhancement, Periodically-Arrayed Nanopillars FRANCISCO BEZARES, JOSHUA CALDWELL, OREST GLEMBOCKI, Naval Research Laboratory, MAARIT KARINIEMI, JAAKKO NIINISTÖ, TIMO HATANPÄÄ, University of Helsinki, RONALD RENDELL, Naval Research Laboratory, MARAIZU UKAEGBU, Howard University, MIKKO RITALA, University of Helsinki, SHARKA PROKES, Naval Research Laboratory, CHARLES HOSTEN, Howard University, MARKKU LESKELA, University of Helsinki — Periodically arrayed Si nanopillars, coated with a thin layer of Ag, have been shown to produce large-area (∼1 mm or more), uniform enhancement of the electromagnetic (EM) field near the surface of such arrays, thus suggesting suitability for the development of next-generation chem/bio-sensors. Although short-range plasmonic coupling effects are expected to increase the enhancement factor of these arrays several orders of magnitude, limitations in current lithographic techniques prohibit the fabrication of closely spaced nanopillars where such coupling effects become significant. Here we show experimentally that the use of Atomic Layer Deposition of Ag allows for the fabrication of Ag-coated Si nanopillar arrays with interpillar spacings of a few nanometers (∼2 nm) resulting in 1-2 orders of magnitude increase in EM enhancement observed throughout the whole array area. Experimental observations that provide insight into the nature of the different coupling phenomena contributing to the overall enhancement of the EM field in these systems will also be discussed.

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