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Metal alloyed nanostructures with tunable optical properties. MARIAMA REBELLO SOUSA DIAS, CHEN GONG, GARRETT WESSLER, MARINA LEITE, Department of Material Science and Eng. Institute for Research in Electronics and Applied Physics - Univ. of Maryland, College Park, MD 20742 — Pure metal nanostructures (Ns) have been widely used to enhance the optical response of optoelectronic devices, ranging from photovoltaics to broadband absorbers. However, their use is limited by their fixed optical properties. The development of metallic materials with modulated optical response could lead to a new class of Ns for optoelectronic devices with enhanced performance. In this work, we simulated and measured the optical response of binary mixtures of silver (Ag), gold (Au) and aluminum (Al) nanoparticles. We resolved the broadband forward scattering of these alloyed nanoparticles when applied to solar cells by finite-difference time-domain (FDTD) calculations. For a realistic prediction, we used the measured dielectric function of thin-films with identical chemical composition. We demonstrate that, in some cases, an alloy can outperform their pure metal counterparts, *e.g.* $Ag_{0.5}Au_{0.5}$ shows increased light absorption at 800 nm than pure Au and Ag. The optical response of the alloyed Ns and its dependence with size and composition is measured by transmission and near-field scanning optical microscopy (NSOM). The use of alloyed metals as building blocks for broadband absorbers, where a large imaginary part of the dielectric function is desired, will also be discussed.

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