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Combining magneto-optics with plasmonics in gold-nickel nanoparticle arrays MIKKO KATAJA, SARA POURJAMAL, NanoSpin, Aalto University, NICOLÓ MACCAFERRI, PAOLO VAVASSORI, CIC NanoGUNE, TOMMI HAKALA, MIKKO HUTTUNEN, PÄIVI TÖRMÄ, COMP, Aalto University, SEBASTIAAN VAN DIJKEN, NanoSpin, Aalto University — Periodic arrays of metallic nanoantennas support intense surface lattice resonances (SLRs) with very narrow linewidths that arise from radiative coupling between the surface plasmon polaritons of the individual nanoparticles. Combining plasmonic systems with active components such as magneto-optical materials opens up new possibilities for active optical devices. Here, we present a new versatile method of integrating ferromagnetic and noble metal plasmonic nanostructures leading to strong magneto-optical responses in conjuncture with drastically enhanced optical reflectivity. The structures under study consist of nickel and gold nanoparticles that are ordered into periodic checkerboard arrays. The gold constituent of these hybrid arrays guarantees intense optical reflectivity. Yet, compared to pure nickel arrays, the magneto-optical signal is practically retained. Local analyses of the radiation fields indicate that the nickel and gold nanoparticles both actively contribute to the magneto-optical activity of the hybrid lattice via radiative coupling. The results also demonstrate that the size of the noble metal nanoparticles can be used to tailor magneto-optical spectra, providing a new tool for designer magneto-optical materials.

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