off diagonal elements of the electric permitivity tensor. Whether similar behaviour is present in our case, where we have a magnetic metal with a smaller corresponding permitivity element (for the case of Ni: $\varepsilon_{xy}(660nm) = -0.20166391 + i0.00708567$), needs further future investigations.

4. Conclusions

The optical and MO response of a hexagonal anti-dot pattern, with a pitch distance of 470 nm and hole diameter $d = 275$, are revealed to exhibit strong coupling between the SPPs and the MO activity. The intensity minima in the reflectivity coincides with the excitation of SPPs, arising from the coupling between the incident light and the 2D hexagonal lattice. The spectral position of the minima depends on the periodicity of the structures and subsequently on the different diffraction orders of the 2D grating. Large changes in the MO signal are observed at the corresponding minima in the reflectivity, confirming the importance of SPPs on the magnetic response. Angular and energy dependent measurements of the reflectivity reveal the importance of surface plasmons and the possibility to control the coupling of SPPs in the magnetic metal by changing the scattering geometry. The use of theoretical simulations for optimizing the design and resulting properties is shown to be conceivable, which can be of importance for developing new ways to use combined magneto-optic and surface plasmon effects for manipulation of light.

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