

Plasmonic enhancement of second harmonic generation from nonlinear RbTiOPO₄ crystals by aggregates of silver nanostructures - DTU Orbit (09/11/2017)

Plasmonic enhancement of second harmonic generation from nonlinear RbTiOPO₄ crystals by aggregates of silver nanostructures

We demonstrate a 60-fold enhancement of the second harmonic generation (SHG) response at the nanoscale in a hybrid metal-dielectric system. By using complex silver nanostructures photochemically deposited on the polar surface of a ferroelectric crystal, we tune the plasmonic resonances from the visible to the near-infrared (NIR) spectral region, matching either the SH or the fundamental frequency. In both cases the SHG signal at the metal-dielectric interface is enhanced, although with substantially different enhancement values: around 5 times when the plasmonic resonance is at the SH frequency or up to 60 times when it matches the fundamental NIR radiation. The results are consistent with the more spatially-extended near-field response of complex metallic nanostructures and can be well explained by taking into account the quadratic character of the SHG process. The work points out the potential of aggregates of silver nanostructures for enhancing optical nonlinearities at the nanoscale and provides an alternative approach for the development of nanometric nonlinear photonic devices in a scalable way.

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Authors: Sánchez-García, L. (Ekstern), Tserkezis, C. (Intern), Ramírez, M. O. (Ekstern), Molina, P. (Ekstern), Carvajal, J. J. (Ekstern), Aguiló, M. (Ekstern), Díaz, F. (Ekstern), Aizpurua, J. (Ekstern), Bausá, L. E. (Ekstern)

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