Monolithically integrated Q-switched plasmonic nanolaser

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The realization of stable coherent nanoscale light sources is of key significance for the development of novel nanoscience and nanophotonic technologies. Here we demonstrate the simultaneous control over temporal and spatial confinement of coherent radiation at subwavelength regions in a monolithically integrated plasmon-assisted nanolaser device. The approach combines a Nd^{3+}-doped Lithium Niobate crystal which provides laser gain in the NIR spectral region, plasmonic chains of Ag nanoparticles that enable subwavelength spatial confinement of laser radiation, and a 2D-monolayer (MoS_2) acting as saturable absorber to achieve a stable temporal confinement of laser radiation [1].

The results establish the basis for the integration of ultra-fast lasers at the nanoscale, in which the synergetic hybridization of the materials involved could benefit applications such as quantum computing, high-speed communications, ultra-sensitive sensing or advanced manufacturing, providing a wealth of opportunities for light manipulation and control at subwavelength scales.

[1] M. O Ramírez, P. Molina, D. Hernández-Pinilla et al. (2023) Laser Photonics Rev, 2300817, 1-7.

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