

# The Physics and Applications of Coherent Control of Metasurfaces

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**Abstract**— Coherent control of absorption in thin films can be used for optical data processing, spectroscopy and in nonlinear and quantum optics applications.

The new research direction of coherent control of light in 2D matter has its roots in plasmonics, metamaterials, quantum and coherent optics. As has been shown in recent years, the optical properties of films much thinner than the wavelength of light, manifest differently in travelling wave and standing wave light fields in free space. In the latter case, ‘coherent control’ of the energy exchange between incident and scattered waves leads to a plethora of new technological opportunities including image processing and recognition, all-optical logic gates, ultrafast all-optical modulators, quantum optical devices and new spectroscopy technique that can distinguish different multipole contributions to absorption.