# **All-dielectric metasurface engineered absorption in near infrared**

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All-dielectric nanophotonics technology is at the forefront of nanoscience and technology and makes possible to manipulate not only with electric component of electromagnetic radiation but also with its magnetic component. One of the emerging applications of all-dielectric nanophotonics technology is the design of optical devices with tuned absorption. In this work we study the absorption effect in silicon metasurface on bk7 glass substrate. We show, that the absorption of silicon can be enhanced at spectral range in which the silicon experiences negligible absorption. The tuning of the absorption occurs due to the designed and fabricated man-made silicon based metasurface.

To analyze the optical properties such as transmission, reflection and absorption of the metasurface we use multipole decomposition approach. We compare experimental results to the numerical calculations performed with COMSOL. We notice that optical properties of the silicon metasurface relate to the high-order multipoles excitations. We found that resonant electric quadrupole moment leads to the enhanced reflection while resonant magnetic dipole moment enhances the absorption effect. Such multipole excitation provides broadband absorption effect in wavelength range, where silicon does not naturally absorb.

Such metasurfaces are aimed to be utilized in different optical and quantum applications. Our work provides important information for developing 2D optical devices at the nanoscale and tuning optical properties of dielectric metasurfaces.