Nano- and microoptics bringing light to solar absorbers

A solution to our world’s increasing energy demand is right out there: the sun! Every day it sends a multiple of the energy we can consume down to earth. But how can we utilize the sun light most efficiently whilst economizing resources? The aim of saving absorber material brings along incomplete intake of solar radiation. Here, nano- and microoptics can help bringing light to solar absorbers.

With a focus on Chalcopyrite solar cells, nano- and microoptical concepts for light coupling into reduced amount of absorber material are discussed. One direction are micrometer-sized solar cells for operation under concentrator optics. Another approach are ultra-thin absorbers with integrated nanostructures for absorption enhancement. These nanoparticles give rise to resonant and waveguide modes enabling light localization in the Chalcopyrite.

Light coupling and trapping by nanostructures equally constitutes an attractive option for other systems of energy conversion like solar fuel devices. Examples from this field highlight the potential of doubling efficiency and underline the importance of optical concepts for sustainable energy production.