PLASMONIC INTERFACES FOR CELL DETACHMENT TRIGGERED BY NEAR-INFRARED LIGHT

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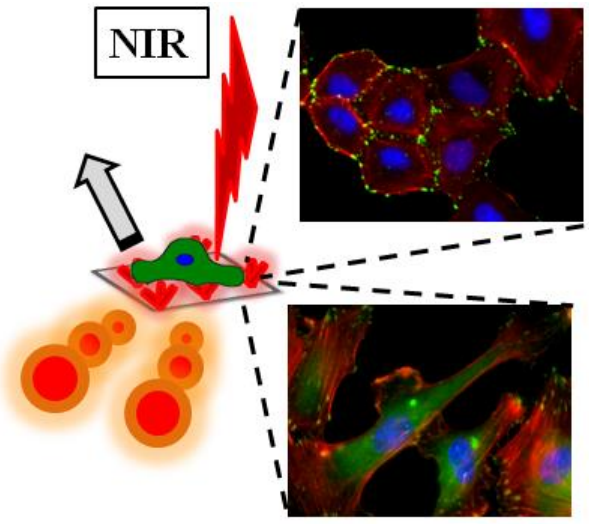
Cell culture is widely employed in biomedical applications and has numerous applications, spanning from diagnosis, therapy, and the production of biological drugs. The necessity to detach cells from a culture substrate during cell harvesting remains one of the most challenging steps in a cell-culture process. Efficient and gentle detachment of cells avoiding damage are therefore most urgent in biomedicine.

A bottom–up approach to build plasmonic substrates based on micellar block copolymer nanolithography to generate a 2D array of Au nanoparticles followed by chemical growth leading to anisotropic nanoparticles has been developed. The resulting plasmonic substrates show a broad plasmon band covering a wide part of the visible and near-infrared (NIR) spectral ranges. These plasmonic substrates incorporate a particular type of light-induced cell-detachment properties. In this type of substrate, a transient hyperthermic effect results from the interaction of light of a given wavelength with nanoparticles integrated in the support. Nanothermometry is used for investigating the interfacial increase of temperature. Different kinds of cells were successfully grown on the substrates. A simple functionalization step of the plasmonic substrates with the c-RGD peptide allowed us to tune the morphology of integrin-rich human umbilical vein endothelial cells (HUVEC). Subsequent irradiation with a NIR laser led to highly efficient detachment of the cells with cell viability confirmed using the MTT assay. We thus propose the use of such plasmonic substrates for cell growth and controlled detachment using remote near-IR irradiation, as a general method for cell culture in biomedical applications.



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