Sub Diffractional STED-Inspired Cationic Lithography

Sourav Islam[1], Marco Sangermano[2], Thomas A. Klar[1]

[1]*Institute of Applied Physics, Johannes Kepler University Linz, 4040 Linz, Austria*

[2]*Department of Applied Science and Technology, Politecnico Di Torino, Torino, Italy.*

Stimulated emission depletion (STED) broke the diffraction limit of resolution in fluorescence microscopy and it has been proposed that a STED-confined excitation volume should be equally applicable to spatially control chemical reactions on the nanometre scale.[1] Meanwhile, this prediction has been experimentally realized using free radical polymerization of mostly (meth)acrylates.[2-4]

In this contribution, we will present concepts of how to achieve sub 100 nm structure sizes in STED-inspired epoxide cationic lithography by using a modified system of photosensitizers and initiators. In particular, we use thioxanthones as sensitizers and a sulfonium salt as initiator. The thioxanthones turned out to be optically depletable within the triplet system by transient state absorption depletion (TAD).[5, 6] Making use of this depletion mechanism in the outer rim of the excitation focus, we were able to write sub-diffractional, 125 nm wide epoxide features with isopropyl thioxanthone,[7] and, most recently, even sub-100 nm features using 2-chlorothioxanthone.

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