

# LOW-POWER NANOSCOPY OF UPCONVERSION NANOPARTICLES CONJUGATED WITH GRAPHENE-LIKE MATERIALS

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## 1. BACKGROUND

Upconversion nanoparticles (UCNPs), which can emit visible and ultraviolet fluorescence upon near-infrared excitation, are a powerful tool for optical imaging with improved penetration depth and without photobleaching, photo-blinking, tissue autofluorescence and light toxicity [1]. Recently, efficient optical modulation of UCNPs has been demonstrated for STED microscopy [2]. Conjugating UCNPs with a suitable material or matrix is a rational way to achieve complex functionalities for applications in biology and photonics. In this study, we report on low-power nanoscopy of UCNPs conjugated with graphene-like materials such as chemically derived graphene and graphene oxide (GO).

## 2. RESULTS AND DISCUSSION

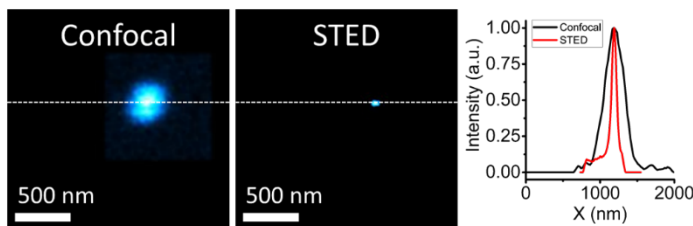


Figure 1: confocal and STED microscopy of UCNPs conjugated with GO.

Using a Gaussian-shaped excitation beam at 980 nm and a doughnut-shaped depletion beam at 808 nm ( $11.25 \text{ MW cm}^{-2}$ ), we imaged UCNPs conjugated with GO with subdiffraction resolution ( $<65 \text{ nm}$ ).

These results may open new avenues for use of functionalized UCNPs for fluorescence nanoscopy, *in vivo* imaging and optical modulation at the nanoscale.

## 3. REFERENCES

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