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Dopant-Engineered Wide-Band Gap Semiconductors for Deep Tissue Bioimaging. ACHYUT RAGHAVENDRA, WREN GREGORY, TYLER SLONECKI, TERRI BRUCE, RAMAKRISHNA PODILA, Clemson University — Optical spectroscopy promises improved lateral resolution for in vivo imaging but is limited by background fluorescence and photon attenuation. There is clearly an unmet clinical need for new hybrid approaches that use fluorescence to identify cancer margins intraoperatively during the initial operation. An efficient strategy to increase the imaging depth and diagnostic capability, beyond what two-photon absorption (2PA) offers, is to use longer excitation wavelengths outside the water absorption window through three-photon absorption (3PA). Although a variety of existing fluorescent dyes, fluorescent proteins, and calcium indicators could be used in 3PA, they have low or moderate 3PA cross-sections and suffer from photobleaching. The non-linear 3PA coefficient of such fluorescent probes is often low necessitating high excitation powers, which could cause overheating, photodamage, and photo-induced toxicity. To address this demand we have designed dopant-engineered ZnO nanoparticles (d-ZnO NPs) for enabling 3PA with higher penetration depth, lower background noise, and improved spatial resolution (<1 um) at powers below 5 mW.

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