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Insight into Factors Affecting the Presence, Degree, and Temporal Stability of Fluorescence Intensification on ZnO Nanorod Ends MANPREET SINGH, Georgetown University, RUIBIN JIANG, The Chinese University of Hong Kong, DANIEL S. CHOI, Georgetown University, JIANFANG WANG, The Chinese University of Hong Kong, JONG-IN HAHM, Georgetown University, GU TEAM, CUHK TEAM — We present a combined experimental and simulation study identifying the key physical and optical parameters affecting the presence and degree of fluorescence intensification measured on zinc oxide nanorod (ZnO NR) ends. We aim to provide an insight into the unique optical phenomenon of fluorescence intensification on NR ends (*FINE*) through experimental and simulation approaches and to elucidate the key factors affecting the occurrence, degree, and temporal stability of *FINE*. Specifically, we examined the effect of the length, width, and growth orientation of single ZnO NRs on the NR-enhanced biomolecular emission profile after decorating the NR surfaces with different amounts and types of fluorophore-coupled protein molecules. We quantitatively and qualitatively profiled the biomolecular fluorescence signal from individual ZnO NRs as a function of both position along the NR long axis and time. Additionally, we employed finite-difference time-domain methods to examine both near- and far-field emission characteristics when considering various scenarios of fluorophore locations, polarizations, spectroscopic characteristics, and NR dimensions. Our efforts may provide a deeper insight into the unique optical phenomenon of *FINE* and further be beneficial to highly miniaturized biodetection favoring the use of single ZnO NRs.

Jong-in Hahm
Georgetown Univ

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