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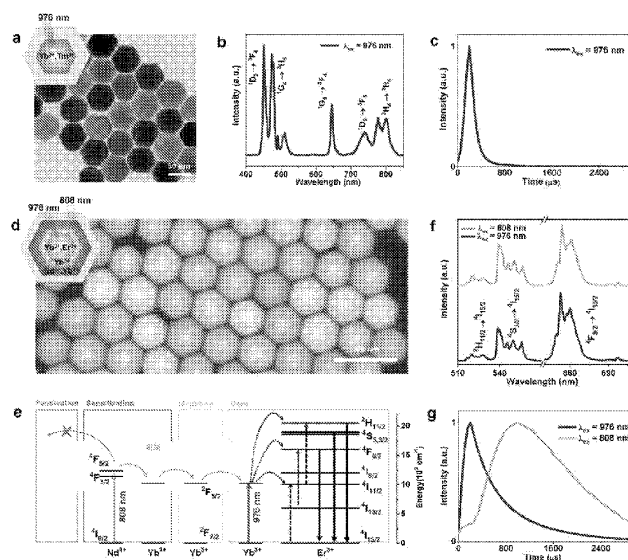


Figure 1

(57) Abstract: The present disclosure relates generally to methods for tuning the time-domain emissive profile of single upconversion nanoparticles using a number of different techniques so as to increase the coding capacity at the nanoscale. The disclosure also relates to time-resolved wide-field imaging and deep-learning techniques to decode the nanoparticle fingerprints.

[Continued on next page]

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