FLUORESCENCE LIFETIME IMAGING WITH NEAR-FIELD SCANNING OPTICAL MICROSCOPY

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Time correlated single photon counting (TCSPC) is integrated with near-field scanning optical microscopy (NSOM) to obtain images of fluorescence lifetimes with high spatial resolution. The technique can be used to measure either full fluorescence lifetime decays with a spatial resolution of less than 100 nm or NSOM fluorescence images using fluorescence lifetime as a contrast mechanism. The technique is applied to thin films of polymers and organic crystals. In the polymers films, the fluorescence lifetime images show the intra- and inter-polymer emitting species are found in the same ratio throughout the films, and the consequence of photochemical degradation. The NSOM images of organic crystal thin film indicate the film is strongly heterogeneous on the mesoscopic scale. The technique will be useful in the study of chemical species with similar spectra but different fluorescence lifetimes or phenomena that can perturb the local excited state lifetime such as resonant energy transfer.