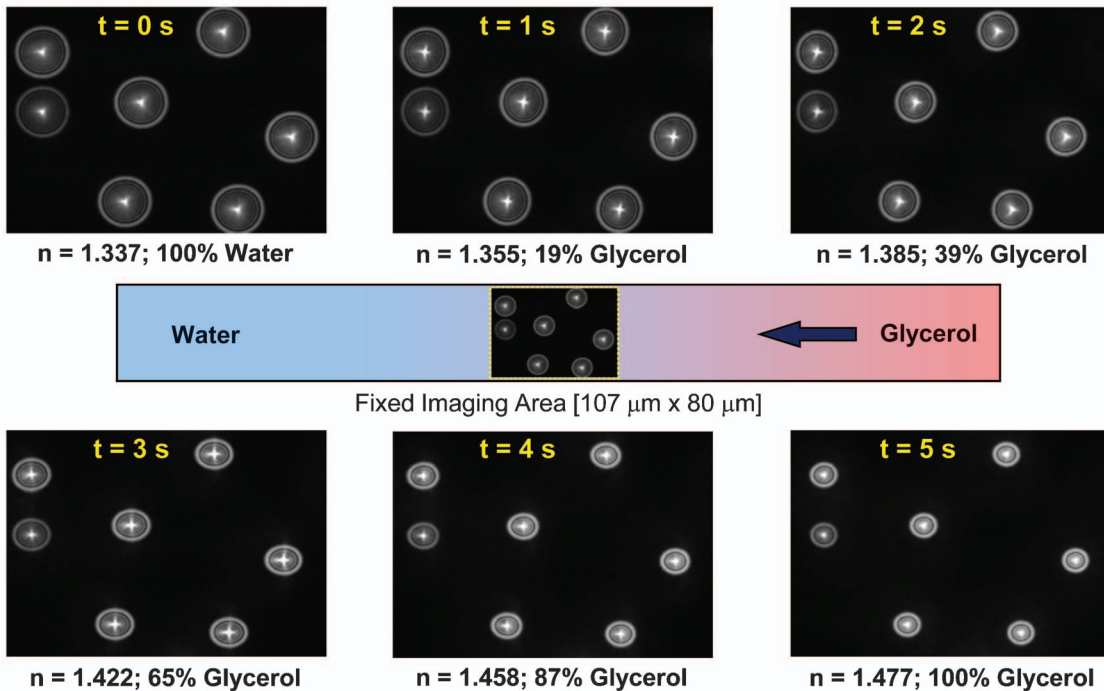


Diffraction patterns (Point Spread Function) of 500 nm fluorescent particles seen through different fluids



Nonintrusive Measurements of Mixture Concentration Fields (Water + Glycerol) by Analyzing Diffraction Image Patterns of Spatially Fixed Fluorescent Nanoparticles

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The 3-D diffraction image patterns of nanoparticles vary distinctly with the refractive index (RI) of a test medium when the nanoparticles are imaged through the medium, such as water ($n = 1.337$) or glycerol ($n = 1.477$). The out-most fringe ring diameter correlates directly with the RI and corresponding mixture concentration, and thus, proper analysis of diffraction patterns provides full-field information on the mixture concentration field. When glycerol flows into water in an open microchannel ($100 \mu\text{m}$ wide), the time-dependent diffraction patterns of spatially fixed fluorescent nanoparticles (500 nm diameter) provide quantitative information on the evolving glycerol concentrations for the mixing region of the two miscible fluids.