



Surface Plasmon Resonance (SPR) Reflectance Imaging: A Label-Free/Real-Time Mapping of Microscale Mixture Concentration Fields (Water+Ethanol)

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A label-free visualization is successfully conducted for nonintrusive, real-time and full-field mapping of microscale mixture (water+ethanol) concentration fields with surface plasmon resonance (SPR) reflectance technique based on Kretschmann's configuration. SPR reflectance is highly sensitive to the refractive index variation of test medium above the thin Au layer with the order of 10^{-5} in the near wall region ($\leq 1 \mu\text{m}$). The Fresnell's equation of SPR reflectance intensity correlates with the medium dielectric constant, and thereby the refractive index and mixture concentration fields. The presented results show that ethanol penetrates into pure water stored in microchannel ($50 \mu\text{m}$ deep \times $91 \mu\text{m}$ wide) by capillary phoretic suction from left to right. The ethanol-water interface rapidly advances to the right inside of the channel and is broadened because of the molecular diffusion progressively occurring during the interfacial advancement.