Fluorescence lifetime-based sensing of methanol
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Abstract:
A fluorescence lifetime-based methanol sensor was developed, utilizing a solvatochromic fluorescence dye, tris(4,4'-dicarboxy-2,2'-bipyridine)ruthenium(II) hexafluorophosphate, The indicator dye was dissolved in a poly(methyl methacrylate) solution, which formed a thin sensing film for methanol when cast and dried on a glass slide, When the film was removed from methanol-free octane and placed in methanol-containing octane, the fluorophore displayed a lifetime change which was measured in the frequency domain using phase-modulation fluorimetry, At 84 kHz, an 8.8 degrees decrease in phase angle and a 9% increase in modulation were found on substitution of octane with a solution of 2% methanol in octane. The response time for a 95% total signal change was about 22 s. The use of the sensor for gas-phase measurements was also demonstrated, As a blue LED was used as the excitation light source, the sensing methodology can be performed with simple and moderately priced instrumentation.

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