

127f Comparison of Covalent “Lid” with Hydrogen-Bound “Lid” in a Caged Lumophore for Measuring Supersaturated Dissolved Oxygen

Yongxia Zhang and Duane T. Johnson

Four alkyl modified beta-cyclodextrins (CD): 6-O-pentyl-CD, 6-O-hexyl-CD, 6-O-octyl-CD, and 6-neopentyl-CD were synthesized as molecular cages for 1-bromonaphthalene (1-BrNp) to detect supersaturated dissolved oxygen (SSDO). The fluorescence enhancement of the covalently-bound “lids” (i.e. the alkyl groups) was compared to the hydrogen-bound “lids” of alcohol-CD ternary complexes. The alkyl-modified CD gave much larger fluorescence intensity than did the alcohol-CD complexes. Because the alcohols are not covalently bound to the CD, they are less efficient at shielding the CD. Among the four different alkyl-modified CD, 1-BrNp in 6-O-neopentyl-CD shows the largest fluorescence and phosphorescence intensity. The covalently linked alkyl groups produce a much more robust caged lumophore that will not degrade as fast as the hydrogen-bound caged lumophores. By relating the concentration of oxygen to the lifetime of the phosphorescence, the dissolved oxygen concentration can be measured. The sensitivities with the complexes containing hydrogen bond lid and covalent bond are compared.