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Fluorescent dipyrin-typical-element complexes responding to external stimuli

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Dipyrins and their complexes have attracted a considerable attention due to their strong absorption/fluorescence properties. In particular, BODIPY (4,4-difluoro-4-borata-3a-azonia-4a-aza-s-indacene) and its derivatives have been often utilized for sensors, bioimaging, OLEDs, solar concentrators, electroluminescence units, and laser dyes. Although more wide-ranging applications are expected on the basis of supramolecular chemistry, the examples using more highly functionalized dipyrin complexes are still limited. Macrocyclic and linear BODIPY derivatives were developed, in which the BODIPY units work as an emissive unit and a binding site for a guest. Upon the complexation with a cationic chemical species, photophysical properties of the BODIPY derivatives were drastically changed. This result indicates these BODIPY hosts would be utilized for selective cationic guest sensing. Another efficient way to synthesize dipyrin complexes with new properties is incorporation of a typical element other than boron. New types of Al, Si, Ge, and Sn complexes of dipyrins that possess two hydroxyl groups as a ligating unit to afford the N₂O₂-type dipyrin complexes were designed and synthesized. Interestingly, the silanol form of the pentacoordinate (hypercoordinate) Si complex is more stable than the siloxane form, which is always much more stable than the silanol in the case of usual tetracoordinate silicon complexes. In addition, interconversion between the silanol and siloxane is achieved by changing the solvent to cause considerable emission change. The corresponding Ge complex exhibits a similar structural and emission change. These novel dipyrin complexes would be useful to construct fluorescent molecular devices and materials responding to external stimuli.

Biography

Tatsuya Nabeshima received his BS (1979) from The University of Tokyo, MS (1981) from University of Tsukuba, and PhD (1985) degrees from Kyoto University. In 1985, he joined Stanford University as a Postdoctoral fellow. He was promoted to Assistant Professor of University of Tsukuba in 1987. He became an Associate Professor in 1995, Professor in 1999, and the Director of TIMS (a research center in Univ. of Tsukuba, 2010-2013). He has received The Chemical Society of Japan Award for Creative Work in 2008.

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