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Hajime Maeda, Kenji Hirose, Masahito Segi



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Synthesis of pyrenocrown ethers as fluorescent sensors and their recognition ability of metal ions

Hajime Maeda*, Kenji Hirose, Masahito Segi

Division of Material Chemistry, Graduate School of Natural Science and Technology, Kanazawa University, Kakuma-machi, Kanazawa, Ishikawa 920-1192, Japan

Abstract

Novel pyrenocrown ethers having different ring sizes were synthesized, and change of fluorescence spectra was investigated upon addition of metal ions. By the addition of Li^+ and Na^+ ions to 10^{-2} M CH_3CN solutions of pyreno-15-crown-5 ether (**3**), excimer/monomer ratio decreased with 3-4 nm longer wavelength shift. Upon addition of Mg^{2+} and Ba^{2+} ions to the solution of **3**, excimer emission increased with 11-25 nm longer wavelength shift. On the other hand, when these metal ions were added to pyreno-18-crown-6 ether (**4**), the excimer/monomer ratio monotonically decreased. Addition of Pb^{2+} ion to solutions of **3** and **4** caused dramatic decrease of both monomer and excimer fluorescence intensity. Inspection of these results indicates that **3** forms 1:1 and 2:1 complexes with respective monovalent and divalent metal ions, whereas **4** forms 1:1 complexes with both monovalent and divalent metal ions. The 1:1 complexes of **3** with monovalent and divalent metal ions emit respective excimer and monomer fluorescence, whereas the 2:1 complexes of **3** emit excimer fluorescence. Monotonical decrease of fluorescence intensity by the addition Pb^{2+} is attributed to heavy atom effect.

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