Determination Of Palladium (II) Ion With A New Phthalocyanine Derivative As A Fluorescent Chemosensor

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The design and synthesis of a sensitive and selective fluorescent sensor molecule is a fundamental goal for organic and analytical chemists in fluorometric metal ion analysis. Besides the search for new fluoroionophores for alkali and alkaline-earth metal ions, much attention has been focused lately on the design of probes for heavy and transition metal ions. So far, the development of practical fluorescent chemosensors for many heavy and transition metal ions is still a challenge. Among such biologically and environmentally important metal ions, the Palladium plays a pivotal role in materials and chemistry. Palladium (Pd)-catalyzed reactions are becoming increasingly important because of the power of making difficult covalent bonds. However, even after purification, residual palladium is often found in the final product, which may be a health hazard. While the proposed dietary intake is <1.5 to 15 μg / day per person (10 ppm of Pd in active pharmaceutical ingredients as a threshold), Pd-catalyzed reactions often produce materials contaminated with Pd at a much higher level requiring extensive purifications and analysis. Typical analytical methods such as atomic absorption spectroscopy, X-ray fluorescence and plasma emission spectroscopy for Pd detection require instruments of high price and sophistication. On the other hand, fluorescence spectroscopy offers a desirable approach which is a sensitive and efficient method to determine palladium from different matrixes.

In this study, a new Phthalocyanine(Pc) with peripherally bound fluoroprobe molecule as a substituent was synthesized and characterized. A comparative study of the recognition property of the Pc derivative for Pd(II) ion has been carried out by absorption and fluorescence spectroscopy. Pc bearing Fluroprobe exhibited spectral change in aggregation peak at UV-visible spectra upon complex formation with Pd(II) ion. This means that Pd(II) metal complexation with Pc derivative effects the concentration of monomeric units by causing intramolecular sandwich formation. On the other hand, fluorescence emission intensity of Pc derivative in the short-wavelength region was quenched and red shift of emission spectra was observed in response to treatment with Pd(II) ion in solution. The emission in the long-wavelength region which belongs to Pc moiety was also quenched by Pd(II) ion. The sensitivity and selectivity of Pc derivative towards to Pd(II) ion was discussed upon change in the peaks at UV-visible spectra and dual emission intensities at fluorescence spectra.