



Friday, 10th February 2017

Session VI: Functional Colorants

Synthesis, applications and practical uses of functional metallophthalocyanines

Nagao Kobayashi

Shinshu University, Japan

Prof. Kobayashi holds two Ph.D. degrees both from Tohoku University, Sendai, Japan. The first, earned in 1978, is in Science and was in the area of peroxidase and catalase. The second, obtained in 1985, is in Pharmacy and involved iron and cobalt porphyrins and phthalocyanines, a subject he is passionate about even today. In between his two Ph.D.s, he spent an year at The Ohio State University as a Visiting Scientist. He joined his alma mater, Tohoku University, as a faculty in 1984 and became Professor in 1995. He was Visiting Professor at ESPCI, Paris, where Madam Curie discovered radium. He retired from Tohoku University in 2015 and has been Research Professor at Shinshu University since then.



Prof. Kobayashi's research interests include electro-reduction of oxygen, design and synthesis of low-symmetry giant aromatic molecules, spectroscopic properties of chromophores and application of giant macrocyclic compounds for photodynamic therapy.

In 2006 the Chemical Society of Japan honoured Prof. Kobayashi with its Award for Creative Work in the chemistry of giant aromatic molecules. He was commended by the Ministry of Education, Culture and Sports in 2012 for his contribution to science and technology. Last year he was bestowed with an award from the Society of Electron Systems.

A much sought after speaker, Prof. Kobayashi has delivered over 120 invited talks in national and international conferences and in Japanese and foreign universities. He has published over 440 papers in top-class journals and authored over 70 critical reviews and book chapters.

Prof. Kobayashi enjoys travelling, listening to classical music, learning about old cultures and working in a farm or a garden. He also enjoys a glass of good wine.



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Abstract:

More than 2000 papers on phthalocyanines (Pcs) have been published till date and more than 50000 tons of Pcs are produced globally each year. They have already been applied or studied in the following fields:

- Dyes and pigments: CuPc
- Charge generation materials in xerography: CuPc
- Catalysts for sulfur-removing processes in the fuel industry: CoPc
- Photodynamic reagents for cancer therapy: AlPc, ZnPc, SiPc
- Optical computer read/write discs: CuPc
- Deodorants: FePc, CoPc
- Germicides and anti-bacterial reagents
- Growth promotion and retardation reagents for plants: CuPc

Other research fields of interest include:

- Chemical sensors
- Conductors
- Electrocatalysis
- Electrochromism
- Electrophotography
- Langmuir-Brodgett films
- Liquid crystals
- Non-linear optics
- One-dimensional metals
- Photovoltaic cell elements for electricity generation
- Semiconductors

Pcs synthesized in a university are generally obtained as powders thereby limiting their direct application. In order to utilize our Pcs we adsorbed these on cotton or synthetic fibers. This presentation will describe how carboxylated FePcs and CoPcs synthesized by us act as oxidation catalyst thereby mimicking biological oxidation; and how these materials are applied for developing new technologies to improve human health and the environment. Application of Zn-, Al-, H₂-, and SiPcs in photodynamic therapy of cancer will also be discussed.