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Editorial

Structure and Properties of Organic Dyes in Solid State

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Color is one of the most fascinating aspects of Nature; it is part of the beauty of the environment that surrounds us, playing a key role in the acceptability of most products used in our society.

A lot of chemistry is behind the term "color". The chemistry of dyes, pigments, and all their intermediates are of interest in diverse fields of activity, not only in basic physical chemistry for understanding the fundamental roles of the chemical bonds and the geometries of colored compounds, but also for application in activities such as the medical research, the synthesis of additives, cosmetics, paints, and so on.. It is obvious that the physical and chemical properties of such compounds cannot be completely understood if their chemical and crystal structures are not fully elucidated. Not only the spectroscopic characteristics but also the physical aspects of their preparation, such as the nucleation and growth or the precipitation, strongly depend on the connectivity of the atoms and on the crystal packing of the systems. Moreover, the photochemical and biological properties of those compounds can be envisaged only if their structures are or can be completely clarified.

This Special Issue of *Crystals* on "*Structure and Properties of Organic Dyes in Solid State*" is designed as a collection of papers covering the broad field of investigation of the structure and properties of organic dyes in solid state that appear as such or crystallized or co-crystallized with any type of substrate. It contains original contributions and a review article.

Prof. Rosenman, Morelli, and Ginzburg [1] compiled an interesting review titled "*Fluorescence phenomena in amyloid and amyloidogenic bionanostructures*". The article is focused on fluorescent labels development and comparison for amyloidogenic bionanostructures study. It is rather comprehensive of the most relevant literature in the field, and a new generation of fluorescence biolabels based on the recently found biophotonic effect of visible fluorescence is described as well. The authors underline that a wide range of nanostructures have multifunctional optical properties such as nonlinear optical, electrooptical, birefringence, tunable visible fluorescence, and light waveguiding effects, and many of these properties are structural- and/or fold-sensitive. In the cases studied by the authors, amyloidogenic bionanostructures could be modulated by the refolding of their biological secondary structure.

Prof. Kennedy [2] present a crystallographic study on monosulfunated azo dyes, covering a great number of structures for the comparative analysis on bond distances and geometrical parameters. In particular, this contribution reports a study of variously (de)protonated forms of a wide variety of azo dyes. Azo colorants are one of the most widely used kinds of dyes. In many cases, they present sulfonate groups, which are responsible for the aqueous solubility. The azo coupling reaction allows a wide range of functional groups to be inserted, in aqueous media, into several compounds with different color properties. This study analyzes the structural differences and effects derived from a large variety of substituents on monosulfunated azo dyes, starting from literature reported structures. Moreover, the authors report, for the first time, the crystal structure of an azo dye with a hydronium cation. It is shown that protonation of the azo bond gives predictable bond length variations.

Prof. Tanaka [3] and his coworkers demonstrate a new strategy for aggregation-induced emission and crystallization-induced emission active molecules, based on skeletal distortion in azomethine boron

complexes. New compounds have been completely characterized, and a detailed investigation into the photophysical properties of phenyl quinoline-based boron complexes with a highly distorted structure and phenyl quinoline-based boron complexes with a planar skeleton is presented for the first time. This study demonstrates that conjugated element blocks with distortion caused by boron complexation might be a promising starting point for obtaining advanced stimuli-responsive optical materials.

Finally, Prof. Tonk [4] presents an original work titled "*Performance Comparison of* Eichhornia crassipes *and* Salvinia natans *on Azo-Dye (Eriochrome Black T) Phytoremediation*". This work is centered on phytoremediation with two model plants for the removal of the chosen title dye from waters. Organic pollutants, and between them several dyes, have a tremendous effect on the aqueous environment; therefore, their elimination from wastewater is a huge priority. In this work, two model plants with high phytoremediation capability were exposed to various concentrations of Eriochrome Black T dye, and their capacity to assimilate it was studied by spectrophotometric methods, monitoring the dye concentration. Changes in the oxidative- and photo-degradation of the dye in time and the solid-state properties of the dye were investigated. The results demonstrated that both *Eichhornia crassipes* and *Salvinia natans* succeeded in reducing the organic dye concentration in water, and the solid-state characteristic of the dye can help in monitoring the decrease of the dye pollution.

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