Transient Absorption, Low-Temperature Raman, Fluorescence Quantum Yield and Stationary Absorption Studies of Various Metal Phthalocyanines and Their Sulfonated Derivatives

P. Ciacka[1], A. Jarota[1], B. Brozek-Pluska[1], H. Abramczyk[1,2]

[1]Laboratory of Laser Molecular Spectroscopy, Institute of Applied Radiation Chemistry, Technical University of Lodz, Wroblewskiego 15 st., 93-590 Lodz, Poland, tel.: (48 42) 631 31 75, 631 31 62, 631 31 88, fax: (48 42) 684 00 43, [2]Max-Born-Institut, Max-Born-Str. 2A, 12489 Berlin, Germany, e-mail: abramczy@mbi-berlin.de

Phthalocyanines, well-known dyes, have recently gathered a lot of interest in scientific community. In view of their new and promising applications as PDT photosensitizers, chemical sensors and display and memory devices, determining photochemical properties of phthalocyanines becomes very important. Several important processes, such as aggregation, singlet oxygen generation, intermolecular charge transfer and its dependence on molecular surroundings can be monitored using optical spectroscopy methods, stationary as well as time-resolved ones.

We report recent results for liquid solutions of Al, Fe(II) and Zn phthalocyanines and their sulfonated derivatives obtained by means of femtosecond transient absorption spectroscopy, Raman spectroscopy using cryogenic cooling and stationary absorption.

Raman spectra collected for room as well as low temperatures provide insight into intermolecular charge-transfer process manifesting itself as fluorescence of radicals. The role of structural changes (i.e. phase transitions) in this process is also highlighted.

Femtoscond time-resolved measurements enable us to further elucidate the nature of transient species and provide clear explanations of spectral features. For instance, the technique has given a strong evidence of intramolecular charge-transfer character of fluorescence at 540 nm, in contrast to what has previously been reported in literature.

Stationary absorption and Raman spectra were used to calculate fluorescence quantum yields of compounds in question.