

Title: Methods of Study of Photosensitizer-photophysics with Application on Thiazolyl-porphyrins

Author: Marek Scholz

Department: Department of Chemical Physics and Optics

Supervisor: RNDr. Roman Dedic, Ph.D.

Supervisor's e-mail address: Roman.Dedic@mff.cuni.cz

Abstract: Photodynamic therapy for oncologic and various chronic diseases is a rapidly emerging method of treatment. It is based on the production of highly reactive singlet oxygen and free radicals by excitation energy transfer from the molecules of photosensitizers. Photosensitizers are preferentially accumulated in the target tissues and locally illuminated. This way produced reactive species cause apoptosis or necrosis of the cells leading to the desired therapeutic effect. Synthesis and subsequent photophysical characterization of photosensitizing dyes is a fundamental part of the development of photodynamic methods. The main aim of the work is to explain the most widely used methods of photophysical study of photosensitizers and apply them to new synthesized photosensitizers: thiazolyl-porphyrins. Methods of absorption and fluorescence spectroscopy, flash-photolysis, time- and spectral-resolved detection of luminescence, optoacoustic spectroscopy and other spectroscopic methods were used. Thiazolyl-porphyrins proved to be promising new photosensitizers with singlet oxygen quantum yield close to unity. The work also contains the development of an experimental setup for microscopic imaging of infrared luminescence using a unique intensified infrared camera. This method could significantly contribute to the understanding of the effects of photosensitizers directly in living cells. The work was done in collaboration with Institut Químic de Sarrià, Universitat Ramon Llull, Barcelona. Keywords: thiazolyl-porphyrin, photosensitizer, singlet oxygen, phosphorescence, quantum yield