ABSTRACT

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Title of Diploma Thesis: Stability evaluation of magnesium complexes of phthalocyanines and azaphthalocyanines under acidic conditions

Phthalocyanines are categorized as analogues of porphyrin where the structures is based on four isoindoline units condensed via a nitrogen atom. Alongside subphthalocyanines, these compounds are attracting attention as useful dyes that find application in photodynamic therapy, organic electronic devices, organic solar cells and other areas. Phthalocyanines are capable of forming complexes with different types of metal and can be used in fluorescence probing due to their suitable absorption and emission in the red region of the visible spectrum. Red or near-infrared excitation and emission is important for biological applications since longer wavelength light penetrates deeper into tissues, it is less scattered and the autofluorescence of endogenous chromophores is limited. The photophysical and

photochemical properties of phthalocyanines and their analogues depend highly on the central metal and peripheral substitution. The magnesium complexes are highly suitable for the diagnostic purposes as they emit strongly fluorescence and are characterized by rather low singlet oxygen quantum yields.

In my thesis, we have conducted numerous experiments to determine the stability of four magnesium phthalocyanines in water, organic solvent (tetrahydrofuran), liposomes, microemulsions and silica nanoparticles. The transition of a metal complex to a metal -free ligand can be observed in the absorption spectra by the decrease of the Q-band followed by its splitting. From our experimental data, we may conclude that phthalocyanine complexes of magnesium with bulky substituents serve as a better protection of the macrocyclic core from demetallation compared to non-bulky substituents. In the organic solvents, protonation of the phthalocyanine complex occurs first and afterwards it is followed by the formation of a metal-free complex unlike in water where the demetallation occurs directly without presence of the detectable protonated form. In the case of delivery systems, we have observed that liposomes serve as a better protection system from the acidity of the surrounding system compared with the microemulsions. In the case of silica nanoparticles, we have observed a decrease of the emission spectra that is

independent of the pH value. The results of this experimental project can serve as a valuable foundation for future studies.