



Tetra and octa(2,6-di-*iso*-propylphenoxy)-substituted phthalocyanines: a comparative study among their photophysicochemical properties

Ahmad Tuhl^a◇, Wadzanai Chidawanayika^b, Hamada Mohamed Ibrahim^a, Nouria Al-Awadi^a, Christian Litwinski^b, Tebello Nyokong^b◇, Haider Behbehani^a, Hacene Manaa^c and Saad Makhseed^{*a}

^a Department of Chemistry, Kuwait University, P.O. Box 5969, Safat 13060, Kuwait

^b Department of Chemistry, Rhodes University, Grahamstown 6140, South Africa

^c Department of Physics, Kuwait University, P.O. Box 5969, Safat 13060, Kuwait

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ABSTRACT: This work reports on the synthesis of novel metal free, zinc, aluminum, gallium and indium tetra and octa (2,6-di-*iso*-propylphenoxy)-substituted phthalocyanine derivatives. UV-visible and ¹H NMR analyses confirm that a non-planar conformation, adapted by the phenoxy substituents due to steric interaction in both derivative series, perfectly discourage cofacial aggregation. Fluorescence quantum yields vary as a function of the number of substituents on the ring periphery, while the fluorescence lifetimes display no distinct trend. Triplet quantum yields are significantly larger for the tetra 2,6-di-*iso*-propylphenoxy-substituted derivatives relative to their corresponding octa-substituted species. However there was no overall trend in the triplet lifetime values. For almost all of the phthalocyanine derivatives, singlet oxygen was produced with relatively good quantum yields. This study explores the possibility of fine-tuning their physicochemical properties by simple structural modification.

KEYWORDS: di-*iso*-propylphenoxy, phthalocyanine, photochemistry, photophysics.

INTRODUCTION

Phthalocyanines (Pcs) and derivatives thereof show potential as photosensitizers for many applications including in non-linear optics and photodynamic therapy (PDT) [1–8]. For these applications, large triplet state yield and long triplet state lifetimes are required.

With their π -conjugated planar organic structure, Pcs interact strongly with light over most of the visible spectrum. Diversification of the phthalocyanine by substitution at the ring periphery, axial position and central metal atom could alter the solubility, electronic absorption characteristics and photosensitizing behavior of Pcs [9, 10].

MPC derivatives containing diamagnetic non-transition centrals, are photoactive, and are often employed in photosensitization [11–13]. Interest in improving the photophysical properties of the Pc ring system continues to grow rapidly. This has stirred research into examining new Pc compounds whose structures promote good photophysical behavior [14–16]. Therefore this work is focused on the synthesis and subsequent photophysicochemical characterization of novel tetra and octa di-*iso*-propylphenoxy substituted metal free, aluminum, zinc, gallium and indium phthalocyanines. For the di-*iso*-propylphenoxy tetra substituted complexes, the chlorine atom is also present on the periphery of the ring. Halogenated phthalocyanines have been reported to show improved photosensitizer activity for PDT compared to non-halogenated derivatives [17–19]. With the exception of octa-substituted zinc derivative [20, 21] to date there have been no reports on the synthesis of tetra-substituted derivatives. Ameliorating the

◇SPP full member in good standing

*Correspondence to: Saad Makhseed, email: saad.makhseed@ku.edu.kw, tel: +965 24985538, fax: +965 24816482