



BSA/DNA binding behavior and the photophysicochemical properties of novel water soluble zinc(II)phthalocyanines directly substituted with piperazine groups

Khaoula Khezami^{1,2} · Kevser Harmandar¹ · Esra Bağda³ · Efan Bağda⁴ · Gamze Şahin³ · Nurşen Karakodak⁴ · Mahmut Durmuş¹

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Abstract

In the current research, two novel zinc(II) phthalocyanines (ZnPcs) (**1** and **2**) directly connecting with 4-(4-methylpiperazin-1-yl)phenyl groups have been synthesized through the Suzuki–Miyaura coupling reaction. These ZnPcs **1** and **2** were converted to their water-soluble derivatives (**1Q** and **2Q**) by quaternization. The photochemical and photophysical properties were determined in DMSO for the non-ionic zinc(II) phthalocyanines (**1** and **2**) and in both DMSO and aqueous solutions for the quaternized cationic derivatives (**1Q** and **2Q**) to establish their photosensitizer capabilities in photodynamic therapy (PDT). The spectrofluorometric and spectrophotometric techniques were employed for the determination of interaction between water-soluble ZnPcs (**1Q** and **2Q**) and BSA or ct-DNA. The binding constants of these compounds to BSA were found in the order of 10^8 M^{-1} . The binding constant of the ct-DNA interaction with **2Q** ($1.09 \times 10^5 \text{ M}^{-1}$) was found higher than **1Q** ($6.87 \times 10^4 \text{ M}^{-1}$). The thermodynamic constants were determined for both **1Q** and **2Q**. The endothermic and spontaneous nature of interaction was observed with ct-DNA. Besides, the thermal denaturation and viscosity studies proved the non-intercalative mode of binding for both compounds to ct-DNA.