FABRICATION OF EFFICIENT NONLINEAR OPTICAL ABSORBER USING Zn(II) PHTHALOCYANINE–SEMICONDUCTOR QUANTUM DOTS CONJUGATES

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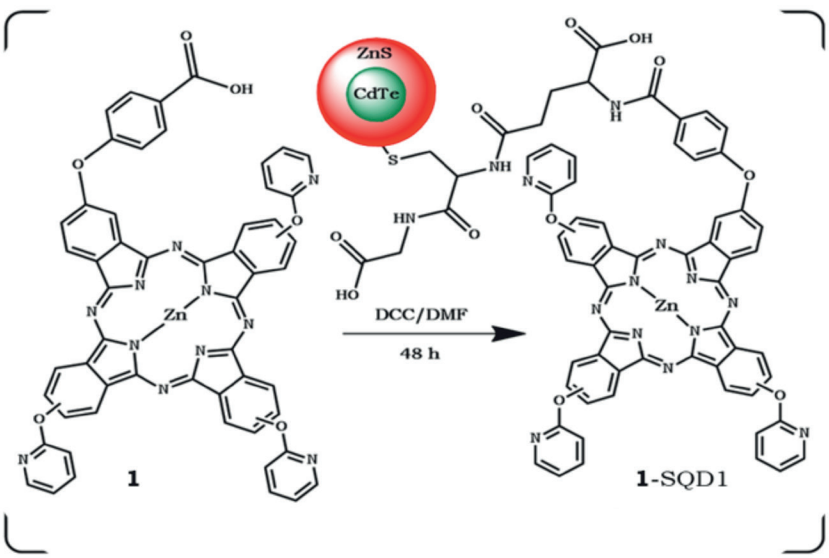
The search for material that can protect optical sensors from hazardous laser damage and components have been increasing over the years. These materials have the ability to attenuate the passage of a high amplitude laser beam whilst allowing the transmittance of low intensity light [1]. A number of optical limiters have been used and among which are metallophthalocyanines (MPcs). MPcs possess good nonlinear optical (NLO) properties such as large nonlinear absorption coefficient (βeff), inherent fast response time and efficient limiting threshold intensity [1]. NLO properties of MPcs improve significantly in the presence of semiconductor quantum dots (SQDs) [2]. Herein, a number of novel MPcs have been synthesized, covalently liked to core/shell and core/shell/shell SQDs via amide bond [2], Scheme 1). The optical limiting behaviour of the Pc complexes and conjugates are assessed using the open aperture Z–scan technique at laser excitation wavelength of 532 nm with 10 ns pulse. Pcs complexes showed good nonlinear optical response with higher nonlinear absorption coefficient [2]. The conjugates afforded higher nonlinear absorption coefficient than Pc complexes alone.



Scheme 1: Covalent coupling of complex 1 to core/shell SQDs.

References
1. R. L. Sutherland, Handbook of Nonlinear Optics, Marcel Dekker, New York, NY, 2nd edn, (2003)
2. S. Mgidlana, D. O. Oluwole, T. Nyokong, Polyhedron, 159 (2019) 102-115.