COMPUTATIONAL INVESTIGATION OF SELF-PHASE MODULATION IN PHTHALOCYANINE ISOMERS

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Phthalocyanines (Pcs) possess a range of nonlinear optical properties[1], notably nonlinear absorption, nonlinear refraction and self-phase modulation. Due to Pcs complex electron structure, their nonlinear response can vary drastically with differing powers of incident light[2].

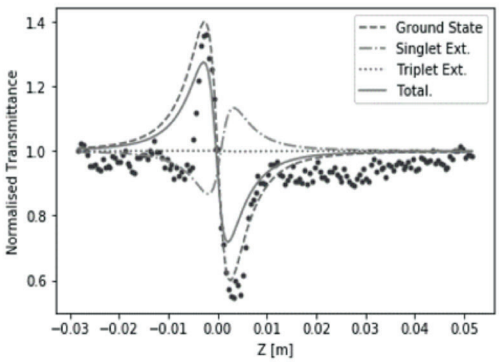

Figure 1. Closed Appeture Z-Scan of a Pc

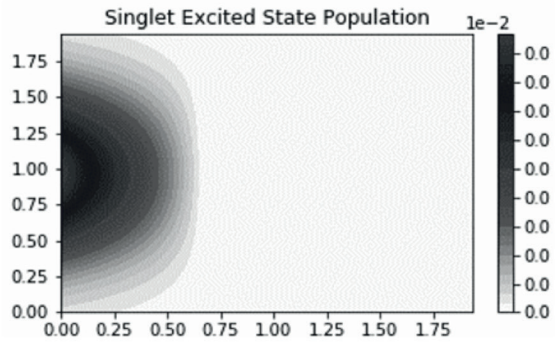

Figure 2. Cross-section of singlet population in sample

This work investigates the structural and electronic causes of deviation of nonlinear behaviour across power levels, such as deviation in self-phase modification. This is done by an examination of chemically similar Pc isomers, which are analysed with both parametric (real and imaginary susceptibility) and non-parametric[3] (multi photon and excited state cross-sections) models such as those shown in figures 1 and 2 respectively. The advantages and disadvantages of these models will be discussed, with a focus on the effects on self-phase modulation and its underlying causes.

References
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3. Chen, P., Tomov, I. V., Dvornikov, A. S., Nakashima, M., Roach, J. F., Alabran, D. M., & Rentzepis, P. M. J. Phys. Chem 100 (1996), 17507–17512.