Carborane Based π- Conjugated Systems for Two Photon Absorption (TPA)

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Abstract

The two-photon absorption (TPA) process is a third-order nonlinear optical (NLO) process in which materials simultaneously absorb two photons. Acceptor-Donor-Acceptor (A-D-A) or Donor-Acceptor-Donor (D-A-D) materials usually exhibit large two-photon cross section that can be applied like 3D optical data storage, optical limiting, microfabrication, photodynamic therapy or imaging. [1] Icosahedral 1,2-dicarba-*closo*-dodecacarboranes or *o*-carboranes have highly polarizable spherical aromaticity through σ-delocalized electron densities.[2] Consequently, they display characteristic electronic properties as well as thermal, chemical and photochemical stability. These features make them interesting systems, especially for luminescent materials.[3],[4],[5] Carborane clusters, usually have a significant impact when attached to larger functionalities, acting as electron-acceptor groups linked through the carbon cluster. Thus, we aimed to prepare acceptor-donor type of systems containing *o*-carborane as an acceptor group. To this purpose, insertion reaction of decaborane ($B_{10}H_{14}$) into the acetylene precursors of fluorophores was performed (Figure 1). Therefore, a set of *o*-carborane based π-conjugated systems have been synthesized and characterized by usual techniques such as FT-IR and ^{1}H, ^{13}C and ^{11}B NMR spectroscopy. Furthermore, their photophysical properties (absorption and emission spectra) were analysed. Their potential TPA properties might lead to a prospective application in biomedicine, especially in super-resolution fluorescence microscopy and also in optical limiting.

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FIGURES

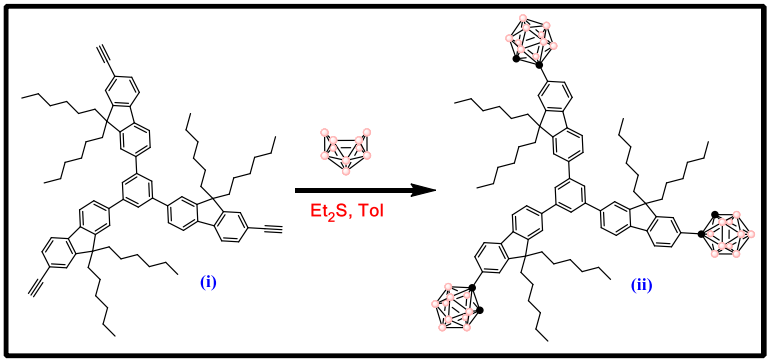

Figure 1: Preparation of carborane based π-conjugated system by insertion reaction.