Syntheses and Characterization of Water-soluble Two-Photon Initiators based on Triphenylamine Scaffolds

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In recent years, two-photon absorption has attracted growing interest due to its potential applications in materials science and biological imaging. [1,2] The lack of highly efficient two-photon absorption initiators (TPIs) is still a major drawback of this technology. Especially in biological systems, water-soluble TPIs are needed for two-photon induced polymerization (2PIP) of e.g. hydrogel scaffolds.

Recently, we have investigated triphenylamine (TPA)-substituted thiophenes with various substituents (R_1 = -OMe, -*t*Bu, -Me, -TMS, -H, -F, -CN and -SO_2Me; R_2 = -H) forming donor-acceptor-donor (D-A-D) systems (Figure 1, a), which were proven to be efficient new scaffolds for TPI. [3]

In this contribution, we focus primarily on the introduction of electron-donating PEG and electron-withdrawing carboxylate groups on the TPA moiety resulting in water-soluble TPIs. Secondly π-conjugated linkers will be used to tune the 2PA properties.

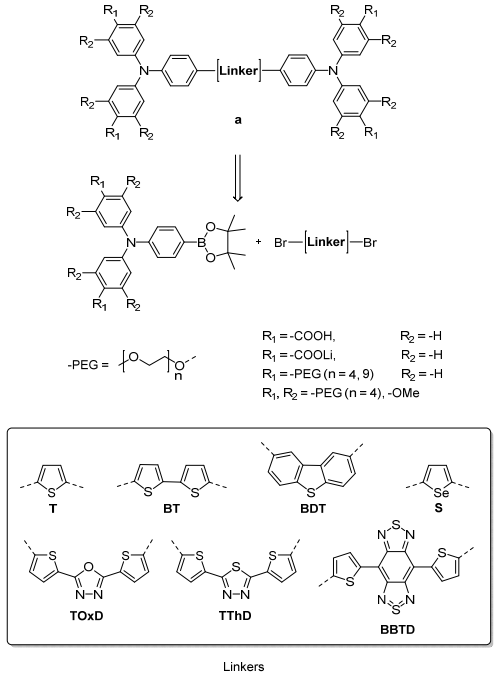

Figure 1: Triphenylamine based water-soluble TPIs

The synthetic assembly of TPAs bearing either PEG groups of varying length (n = 3, 9) or carboxylates and planar linkers via Suzuki-Miyaura coupling will yield new water-soluble D-A-D systems. The synthesized compounds will be characterized by means of UV-Vis spectroscopy and cyclic voltammetry. Their electrochemical and photophysical properties will be discussed in this contribution. Furthermore, selected target compounds will be used as TPIs in 2PIP structuring tests.

[1] M. Rumi, S. Barlow, J. Wang, J. W. Perry, S. R. Marder, Adv. Polym. Sci., 213, 1-95, (2008).

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[3] B. Holzer, M. Lunzer, A. Rosspeintner, G. Licari, M. Tromayer, S. Naumov, D. Lumpi, E. Horkel, C. Hametner, A. Ovsianikov, R. Liska, E. Vauthey, J. Fröhlich, Mol. Syst. Des. Eng., 4, 437-448, (2019).