A smart photosensitizer based on red emitting solution processable porous polymer: generation of reactive oxygen species

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Abstract: Design strategy for the development of a smart photosensitizer capable of generating both the singlet oxygen and superoxide anion radical by low energy excitation has attracted a great deal of attention due to numerous applications in catalysis and biology.[1]In this context, the conjugated porous organic polymers (CPOPs) have been evolved as an emerging material for improving the ROS generation ability due to the presence offunctionalizable pores, tunable bandgaps as well as high thermochemical stability.[2]However, the insolubility of CPOPs is a major bottleneck for their processability.Thus, achieving solution processability throughcircumventing thestrong π-π stacking among aromatic building blocks in the network polymer is one of the challenging issues to address. Herein, we demonstrated aunique design strategy for the development of a solution processable CPOP (CzBDP)by incorporation of a long alkyl spacer separating the monomeric building blocks to prevent π-stacking. Additionally, the integration of carbazole and boron dipyrromethene (BODIPY) as a part of the molecular building blocks in the polymeric framework leads to the simultaneous generation of singlet oxygen and superoxide anion radical upon photoexcitation (Fig. 1).[3] A detailed structure-property correlation was established through the comparison of the superiority of the porous conjugated polymer towards the ROS generation over that of the constituent monomeric units and linear conjugated polymer. As a proof of concept, the ROS generation capability of CzBDP (solution and thin film) was further substantiated through the metal-free photooxidation reactions.

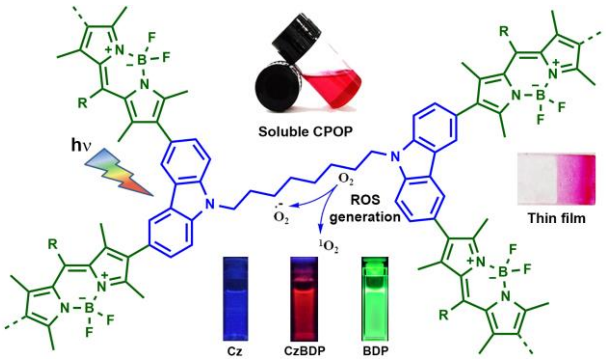

Fig. 1 Schematic illustration demonstrating the design strategy for the fabrication of carbazole (Cz) and boron dipyrromethene (BODIPY) based soluble conjugated porous organic polymer (CzBDP) for the generation of reactive oxygen species (ROS).[3]

References:

1. Nosaka. Y.; Nosaka. Y. A. Generation and Detection of Reactive Oxygen Species in Photocatalysis. *Chem. Rev*. **2017**, *117*, 11302.
2.Ding. X.; Han. B.Metallophthalocyanine-Based Conjugated Microporous Polymers as Highly Efficient Photosensitizers for Singlet Oxygen Generation. *Angew. Chem. Int. Ed.***2015**, *54*, 6536.
3. Bandyopadhyay. S.; Kundu. S.; Giri. A.; Patra. A. A smart photosensitizer based on a red emitting solution processable porous polymer: generation of reactive oxygen species.*Chem. Commun*. **2018**, *54*, 9123.

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List of publications:

1. Kumar. B.; Rathnam. V. S. S.; Kundu. S.; Saxena. N.; Banerjee. I.; Giri. S. White-light-emitting $NaYF_4$ Nanoplatform for NIR Upconversion-mediated Photodynamic Therapy and Bioimaging.*ChemNanoMat*.**2018**, *4*, 583.
2. Bandyopadhyay. S.[#]; Kundu. S.[#]; Giri. A.; Patra. A. A smart photosensitizer based on a red emitting solution processable porous polymer: generation of reactive oxygen species.*Chem. Commun*. **2018**, *54*, 9123 ([#] equal contribution).
3. Kumar. V.; Sk. B.; Kundu. S.; Patra. A. Dynamic and static excimer: a versatile platform for single component white light emission and chelation-enhanced fluorescence. *Manuscript under submission*.