Porphyrin nanorods-polymer composites for solar radiation harvesting applications

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ABSTRACT: The interest in exploring porphyrin-based nanostructures for artificial solar radiation harvesting stems from their structural similarity to chlorophylls. In nature, the precise organization and orientation of the chlorophylls result in efficient absorption of light energy. Inspired by these naturally occurring architectures relevant optical studies including the dynamics of intermolecular and intra-molecular processes of the porphyrin nanorods were investigated. The design of artificial light harvesting systems requires several key factors, such as absorption in the UV-visible and near-infrared wavelengths, energy transfer ability and the selection of light absorbing pigments. Another key factor is the organizational structure through which the components will interact. We attempted to accomplish this by incorporating porphyrin nanorods into polymer matrices and this will also aid in achieving an arrangement where they can be directly used as devices. The nanorods were embedded in a polymeric matrix, using latex technology and electrospinning which gave the possibility of investigating the orientation of nanorods in the polymer. Spectroscopic and microscopic studies were conducted to investigate the optical and morphological properties of the porphyrin nanorods-polymer composites for applications in artificial solar radiation harvesting systems.