

Enhanced luminescence stability and oxidation–reduction potential of polyfluorene for organic electronics: a review

Abstract

In pursuing sustainable technologies, organic electronic-based materials have witnessed remarkable progress, with polyfluorene (PF) among the blue light-emitting polymers garnering significant attention. PF, renowned for its remarkable light absorption and exceptional optoelectronic properties, exhibits great potential for various applications including display technologies, solar cells, lasers and transistors. Nonetheless, the diverse phases in PF significantly affect the performance of optoelectronic devices, predominantly due to the coexistence of different conformations in thin films, while promising, PF confronts hurdles related to stability and degradation during operation, leading to spectral changes and colour purity issue. Since the early 1990s, various studies have been devoted by researchers to determine the chemical changes in the PF chain and its functional groups after being subjected to different types of degradation with the aim of controlling and retarding the decomposition process. Another alternative strategy is to promote the formation of β -phase in PF, which is characterised by well-ordered conformation. This review aims to provide a comprehensive overview of PF degradation behaviour, modes and mechanisms. Various approaches to delay and suppress PF degradation are discussed. Meanwhile, the role of the β -phase in suppressing PF degradation and enhancing optoelectronic applications has also been highlighted. Thus, scientists are diligently attempting to enhance the formation and stability of the β -phase to improve the performance of optoelectronic applications.

Keywords

Conjugated polymer; Ketonic defect; Photoluminescence polymer; Polyfluorene; Polyfluorene degradation; β -phase