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Communication

Synthesis and properties of novel heat-resistant fluorescent conjugated polymers with bisindolymaleimide

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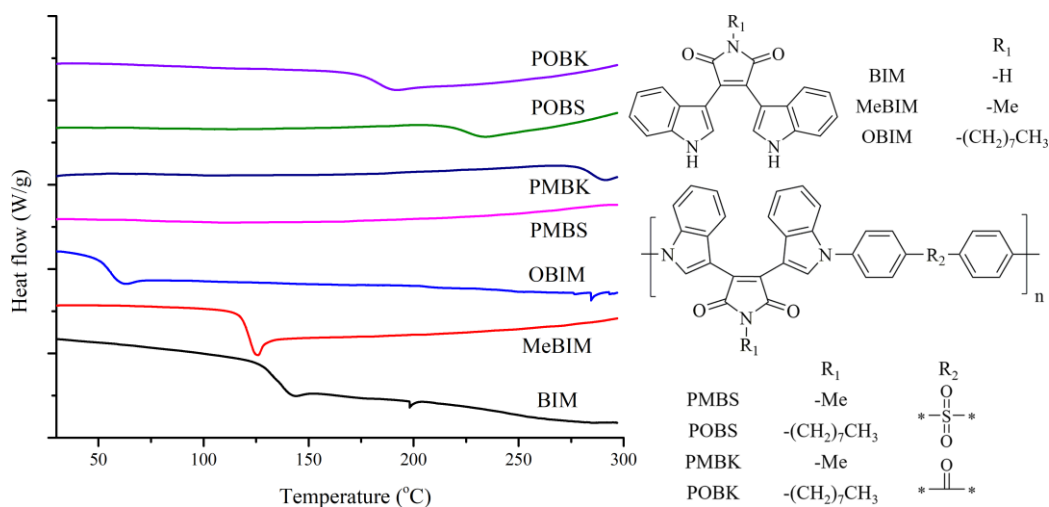
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Graphical abstract



Novel conjugated polymers with bisindolymaleimide were synthesized *via* simple metal-free condensation polymerization. The polymers exhibited high glass transition temperatures and decomposition temperatures with considerable luminescent properties.

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ABSTRACT

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Conjugated polymers with bisindolymaleimide (BIM) backbone are obtained by the condensation polymerization of methyl and octanyl *N*-substituted BIMs with 4,4'-difluoro-diphenylsulfone and 4,4'-difluoro-diphenylketone. The structures of polymers are confirmed by FTIR and NMR spectroscopy. The polymers exhibit both high glass transition temperatures ($T_g > 175$ °C) and high decomposition temperatures ($T_d > 395$ °C). Meanwhile, The UV-vis absorption and fluorescence spectra of the polymers are similar to the corresponding substituted BIMs. The quantum chemistry calculations indicate that the first excited states of polymers are mostly contributed by BIM structures.

Organic light-emitting diodes (OLED) have attracted great interest as thin, large-area, high energy efficiency, high brightness and contrast, and full color display materials in recent few decades [1]. Among the three primary colors necessarily for full color display, red light-emitting materials lag behind blue and green ones in terms of luminescent efficiency and good color fidelity [2]. The low HOMO-LUMO gap in red luminescent materials bring difficulties in design and synthesis and make them easy to quench because of aggregation. As a result, most red luminescent materials are the dopants such as 4-(dicyanomethylene)-2-methyl-6-[4-(dimethylaminostyryl)-4*H*-pyran] (DCM) series [3], polyacene-based materials [4], and rare-earth complexes [5]. However the optimum concentration for dopants is very low and hard to control and it is hard to achieve long lifetime for the device [6].

Bisindolymaleimide (BIM) derivatives (arcyriarubins A) belong to a family of pigments isolated from slime molds (*Myxomycetes*) [7]. Although mostly studied for biological applications, for example as protein kinase C (PKC) inhibitors, they are also excellent red

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