Synthesis of Fluor-Containing Phenylated Polyfluorenes in the Supercritical Carbon Dioxide

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`Blue luminescent polymers have attracted considerable recent attention, both academic and practical, due to their application in full-color displays and green, red, and white LEDs, as well as in design of next-generation light sources [1,2]. Therefore, development of efficient blue luminescent polymers is of importance for such applications. Among blue electroluminescent polymers, of most interest are polyfluorenes (PFs) and their derivatives, which exhibit high quantum luminescence yields and excellent chemical and thermal stability and photostability [3]. However, they are not free of disadvantages. Alkyl-substituted PFs exhibit poor electroluminescence and low color stability due to polymer chain aggregation, oxidative destruction, and the presence of residual high-boiling solvents and metal catalyst traces. In this context, in this work, we have suggested a new catalyst-free method of synthesis of high-purity electroluminescent polymers based on phenyl-substituted polyfluorenes (PSPFs) in supercritical carbon dioxide. The PSPF synthesis by the Diels–Alder reaction in supercritical carbon dioxide afforded high - purity polymers free of traces of high-boiling solvents and metal catalysts. The presence of a large number of side bulky phenyl substitutes made it possible to suppress chain aggregation and improve the solubility and film-forming properties [4]. Size–exclusion chromatography of the polymers with polystyrene standards yielded M_n s and M_w/M_n s from 80000 to 110000 and from 1.4 to 3.8, respectively. The polymers had glass transition temperatures (T_g) in the range of 255-280°C and initial decomposition temperature of 410-490°C both in air and in argon. The polymers form strong optically transparent films in thicknesses of 2-10 μm and have potential as organic dielectrics with Low Dielectric Constant 2.2-2.5

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