Polyamides and Polyimides Incorporated with Pyrenylamine as Fluorophore and Electrochromophore

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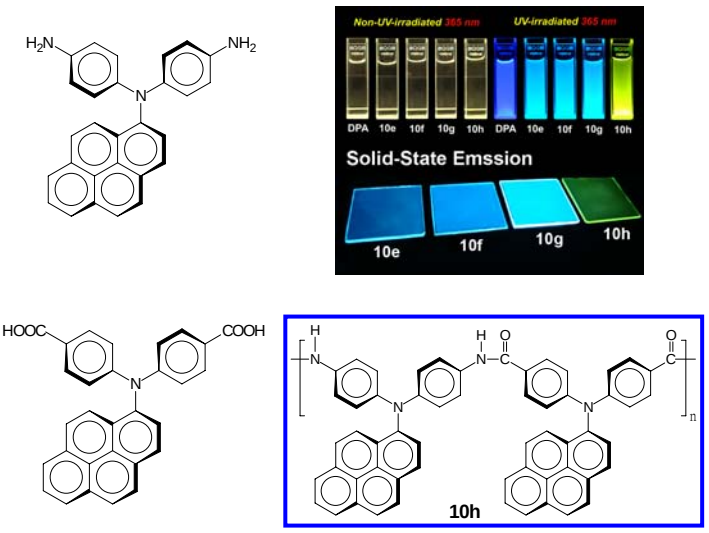
Due to the large planar conjugated aromatic characteristic, pyrene has strong π electron delocalization energy and efficient fluorescence property, and the emission is pure blue to permit ready exploitation as a blue-light emitting material in organic light emitting diodes (OLEDs).[1] Many pyrene derivatives have been used in OLEDs in order to improve hole transporting ability because of the electron-rich property of the pyrene moiety.[2,3] However, the high tendency towards π-π stacking of the pyrene moieties generally lends the pyrene-containing emitters strong intermolecular interactions in the solid state, which leads to a substantial red shift of their fluorescence emission and a decrease of the fluorescence quantum yields. It has been demonstrated that the pyrenes functionalized by sterically hindered aryl rings do not undergo close π-stacking leading to solid-state emission properties that parallel those in the solution state.[4] In addition, diarylamino functionalized pyrene derivatives have been found to perform efficiently as bright blue emitters and charge transport materials in OLEDs.[5] In recent years, we have developed a number of high-performance polymers (e.g., aromatic polyamides and polyimides) carrying the triarylamine unit as an electrochromic functional moiety.[6-8] Our strategy was to synthesize the triarylamine-containing monomers such as diamines and dicarboxylic acids that were then reacted with the corresponding comonomers through conventional polycondensation techniques. The obtained polymers possessed characteristically high molecular weights and high thermal stability. Herein we report the synthesis of two new diamine and dicarboxylic acid monomers with pyrenylamine moiety and their derived polyamides and polyimides. The fluorescent, electrochemical, and electrochromic properties of these polymers with pyrenylamine chromophore are also presented.



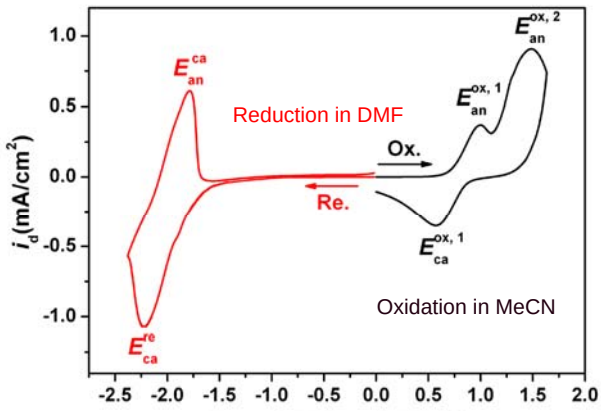


Fig. 1. Cyclic voltammetric diagrams of the polyamide 10h film on an ITO-coated glass substrate.

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