Fabrication of large area oriented thin films of novel organic conjugated polymer p(BZC-DPP) by the ribbon-shaped FTM for Organic Electronic Devices

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Solution processable organic conjugated polymers (CPs) are utilized as active semiconducting elements and have emerged as preferred class of materials for the development of flexible organic electronic devices. The nature of Polymer Backbone with inherent tendency of the molecular self-aggregation of CPs enable the possibility of enhancing the related device performance by orienting the CPs for facile charge carrier transport. In this work, Benzo[c] cinnoline (BZC) unit was coupled to DPP based π - conjugated framework to design novel BZC - DPP class CP with the chemical structure as shown in figure 1 (inset).

This polymer was successfully synthesized, characterized and subjected to the thin film fabrication by ribbon-shaped floating film transfer method (FTM) to prepare large area, uniform and oriented thin films as shown in the inset of the Fig. 1. The thin films of BZC-DPP were characterized using polarized electronic absorption spectroscopy and they exhibited the anisotropic and oriented nature of FTM processed thin films. Extent of orientation was found to highly affected by the polymer concentration and a 2.5% concentration (W/V) was found to be optimum giving a dichroic ratio of about 2.1. It has been found that high temperature (>140^{o}C) thermal annealing of the thin films leads to the slight blue-shift in the absorption maxima associated with twisting of bulky BZC units present in the polymer main chain.

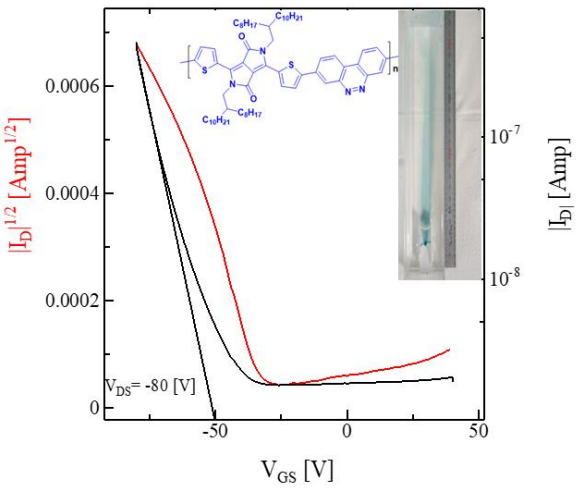

Fig.1. Transfer characteristics of OFETs operated at gate bias voltage of −80 V for p(BZC-DPP) thin films fabricated using ribbon-shaped FTM. Inset shows the chemical structure of the polymer and photograph of the large area thin film fabricated by FTM.

Organic field-effect transistors (OFETs) fabricated using the oriented thin films of p(BZC-DPP) in BGTC device architecture, exhibited a clear p-type charge carrier transport with field effect mobility of 1.5 x 10^{-3}cm^2/V.s and an on off ratio of 10^2 as shown in Fig.1. Results pertaining to the film fabrication, nature of the oriented FTM thin film, macromolecular conformation and their implication on the device performance will be discussed in detail during my presentation.