Polyfluorene and its derivatives exhibit high photoluminescence efficiency and good photostability. These properties made PFs a material of interest and a large number of PF derivatives were reported. However, the poor solubility in common organic solvents and high energy barrier for hole injection limit their LED applications. Molecular tailoring at this point is inevitable and C-9 position of fluorene monomer offers a large number of possibilities. For example, an electron withdrawing substituent at C-9 position will lower the conduction band of the polymer and enhance the electron injection. Fluorenone (FO) is one of the limited number of examples of fluorenes bearing an electron withdrawing group at C-9 position and its polymer, polyfluorenone (PFO), was expected to improve the properties of LEDs via both electron-injection enhancement and hole-migration blocking [1]. However, functionalization of fluorene at C-9 position is not the only way used to enhance the optical properties of PFs. Especially for color tuning purposes, copolymerization is also widely employed [2]. Quinoxalines, on the other hand, are interesting materials due to their high quantum efficiencies and their cation sensing properties [3]. Therefore, it might be interesting to incorporate the quinoxaline moiety as a pendant group to a conjugated polymer chain. In the light of these informations, a series of new fluorene derivatives bearing an electron withdrawing moiety (fluorenone or fluorene with pendant quinoxaline group, Figure 1a and 1b, respectively) as an acceptor unit and thiophene, EDOT or ProDOT as donor units were synthesized. Their corresponding polymers were also prepared via potential cycling in proper electrolytic medium. All the polymers found to exhibit electrochromic behavior with electro and optical stability. Among them, ProDOT donor unit bearing polymers show high coloration efficiencies values as compared to EDOT and thiophene donor unit bearing polymers. Furthermore, it is found that quinoxaline functionalized fluorene derivatives were highly sensitive towards to Fe$^{2+}$ cation which makes them a promising candidate as Fe$^{2+}$ ion sensor besides their use in electronic and optical applications.

Figure 1. Structure of the donor acceptor type fluorenone (a) and quinoxaline functionalized fluoren (b) polymers.

References