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Optimization of 6,13(bis-triisopropylsilylethynyl)-pentacene (TIPS-pentacene) organic field effect transistor: annealing temperature and solvent effect

Since the discovery of organic polymers in 1977,remarkable progress has been made in the development of organic electronics. However, OFET performances are limited by poor charge carriers mobility. Recent studies show several parameters that can influence the performance of the field effect mobility and then the electrical performance of electronics devices. In this study, we demonstrate the effect of solvents and annealing temperature in 6,13(bistriisopropylsilylethynyl)-pentacene (TIPS-pentacene) film. We find that the optical band gap of TIPS-pentacene dissolved in three differents solvents (chlorobenzene, toluene and tetrahydrofuran (THF)) is slightly influenced. The obtained values from the optical spectroscopy of the film from our three solvents are between 1.67 and 1.83 eV. However, the electrical characteristics of filed-effect transistor show the influence of both solvents and annealing temperature. The field-effect mobility varies from cm2.V-1.s-1, cm2.V-1.s-1 and cm2.V-1.s-1 respectively for no-annealed to heating at 120℃ and 150℃ from toluene as solvent. The relationship between solvent and morphology was also investigated and shows that the solvent nature could influence the deposited film morphology. we also investigate the temperature effect effect on crystal struture by XRD characterization and found that the film could crystalized even it doesn't be annealed.

Authors: DIALLO, Abdoul kadri (Université Assane Seck de Ziguinchor); FALL , Sadiara (Université de Strasbourg); KOBOR, Diouma (Université Assane Seck de Ziguinchor); Prof. PASQUINELLI, Marcel (Université Aix Marseille); Prof. HEISER, Thomas (Université de Strasbourg); ESCOUBAS, Stéphanie (Université Aix Marseille); DOUCHE, David (Université Aix Marseille); DIALLO, Abdou Karim (Université Gaston Berger)

Presenter: DIALLO, Abdoul kadri (Université Assane Seck de Ziguinchor)

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