Crystallization and Localization of 6,13-bis(triisopropylsilylethynyl) Pentacene by a Liquid Crystalline Solvent

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A solution-processible organic semiconducting materials have attracted much attention becauses of their low temperature processibility for various flexible devices. Especially, 6,13-bis(triisopropylsilylethynyl) (TIPS) pentacene was widely studied due to its high carrier mobility[1]. However, the mobility of the TIPS pentacene must be improved for widespread applications. Recently, single crystalline structures of soluble organic semiconducting materials have been investigated since their device performance strongly depends on a degree of their molecular ordering[2]. In our previous work[3], we reported a method to produce large size single crystalline structure of the TIPS pentacene by using a liquid crystal (LC) as a solvent. Although we obtained the large size single crystals, the recrystalized sites was not controlled.

In this work, we propose a method to control the recrystallizing points of the TIPS pentacene mixed with the LC by hydrodynamics of the LC. In a conventional surface-stabilized vertical alignment (SVA) with a fish-bone-shaped electrode pattern[4], when an electric field is applied to the SVA cell, the hydrodynamic flow of the LC makes the TIPS penetacene molecules to move to edges of the electrode pattern as shown in Fig. 1. As a consequence, we can crystallize and localize the single crystalline structure of the TIPS pentacene by introducing the liquid crystal as a solvent and thus this method is expected to be useful to fabrication of the high mobility organic devices.

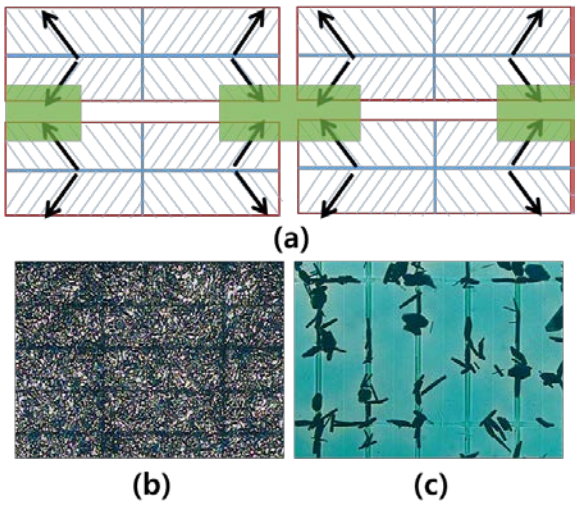

Fig. 1. (a) Flow directions (black arrows) and accumulation of TIPS pentacene (green regions) in SVA electrode pattern, and microscopic texture of the sample (b) before crystallization (c) after crystallization

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