NANO-PATTERNING OF TIPS-PENTACENE AND ITS OPTICAL PROPERTIES

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Introduction

Patterning of organic molecule makes its application versatile and improves its optical or electrical properties. Molecular orientation leads to anisotropic optical absorption, polarized electroluminescence, and photoluminescence. To obtain molecular orientation by patterning, several techniques have been reported from mechanical rubbing, stretching, and nanoimprint lithography. Soft-lithography technique using Polydimethylsiloxane (PDMS, Sylgard 184, Dow Corning) stamp is generally applied for patterning of polymers. Recently, micropatterning of organic active material such as Alq_3 has done using epoxy mold with pressure [1] and heated condition. We made nano-patterns of functionalized pentacene, 6,13-bis(triisopropylsilylethynyl)pentacene (TIPS-pentacene) and measured its optical absorption depending on the orientation.

Experimental

Optical grating with 1800 lines/mm was used as master for PDMS stamp. After curing PDMS, stamp was brought to the TIPS-pentacene surface then slightly pressed. Since the melting point of TIPS-pentacene is 180°C, under the thermal heating of substrate in hot plate > 200 °C, they start melting [2]. Removing PDMS stamp after complete cooling, c.a. 1 hour, patterned TIPS-pentacene remain on the surface.

Results and Discussion

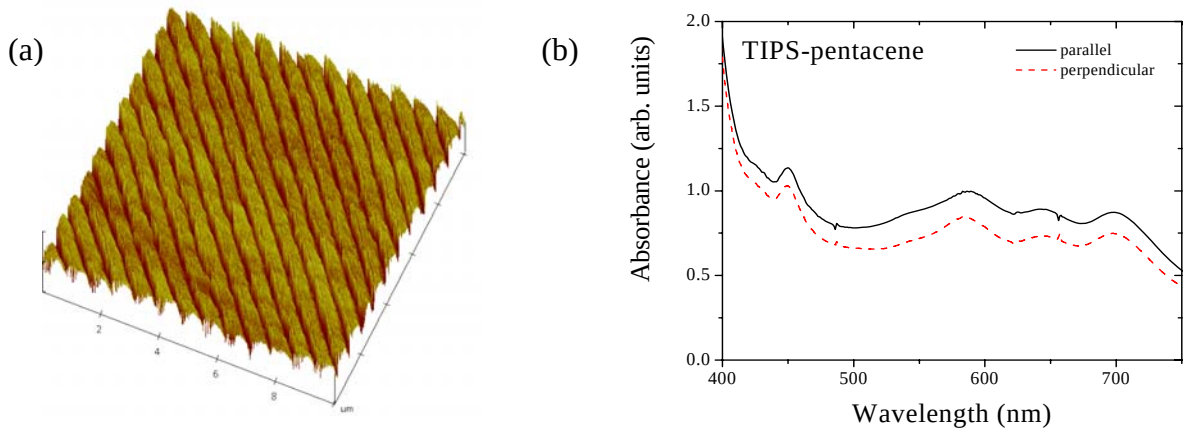

Fig. 1 (a) is Atomic Force Microscope image of submicron patterned image of TIPS-pentacene. The distance between lines is ~ 540 nm, that is the same as optical grating used as a master. Fig. 1 (b) is polarized optical absorption spectra of patterned surface and have some difference in its magnitude. This implies that TIPS-pentacene molecule is preferentially aligned parallel to the line direction. The absorption spectra shown in Fig. 1 (b) is same as bulk TIPS-pentacene.

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References

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[2] Brooks, J.S., *et al.*, Curr. Appl. Phys., **4**, 479 (2004).