MLF Experimental Report	提出日 Date of Report 2017/4/5
課題番号 Project No. 2017A0209 実験課題名 Title of experiment Solution-Processed Organic-Organic Interface Engineering for High Performance Organic-Light-Emitting-Devices 実験責任者名 Name of principal investigator Satoru Ohisa 所属 Affiliation Yamagata university	装置責任者 Name of responsible person Norifumi Yamada 装置名 Name of Instrument/（BL No.） BL16 SOFIA 実施日 Date of Experiment 2017/6/1–3

試料、実験方法、利用の結果得られた主なデータ、考察、結論等を、記述して下さい。（適宜、図表添付のこと）
Please report your samples, experimental method and results, discussion and conclusions. Please add figures and tables for better explanation.

1. 試料 Name of sample(s) and chemical formula, or compositions including physical form.

・Single-layer films

Evaporation-processed TCTA-d24 (eTCTA)

Solution-processed TCTA-d24 (sTCTA)

Evaporation-processed TPBi (TPBi)

・Two-layer films

eTCTA/TPBi (non-annealed or annealed at 120°C 122.5°C, 125°C, 127.5°C, or 130°C for 2 min, 5 min, 10 min, or 20 min.)

sTCTA/TPBi (non-annealed or annealed at 120°C 122.5°C, 125°C, 127.5°C, or 130°C for 2 min, 5 min, 10 min, or 20 min.)

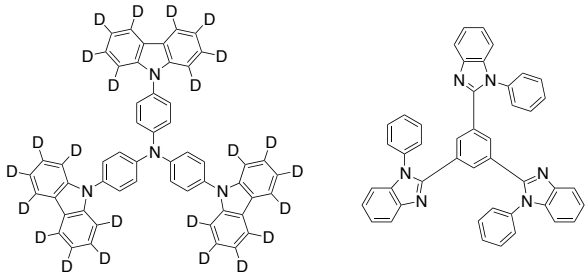

Figure 1. Chemical structures of TCTA-d_{24} and TPBi.

2. 実験方法及び結果（実験がうまくいかなかった場合、その理由を記述してください。）

Experimental method and results. If you failed to conduct experiment as planned, please describe reasons.

The thermal diffusion was investigated between layers in the two-layered films. Glass temperatures (T_gs) of TCTA-d24 and TPBi are 151°C and 124°C, respectively. Hence, the two-layer films were annealed at near the T_g of TPBi. The annealing temperatures were 120°C, 122.5°C, 125°C, 127.5°C, and 130°C, and the annealing

2. 実験方法及び結果（つづき） Experimental method and results (continued)

times were 2 min, 5 min, 10 min, and 20 min. The films were annealed in nitrogen atmosphere. The neutron reflectivity of the films was measured by BL16 SOFIA, and the results were analyzed. Figure 2 shows the layer thicknesses of the eTCTA and TPBi layers in the eTCTA/TPBi films. After annealing at 120°C, and 122.5°C, the thicknesses of each layer were not almost varied, suggesting the thermal diffusion was not occurred in these annealing conditions. At over the T_g of TPBi, the layer thicknesses were varied. The eTCTA layer thicknesses were decreased, whereas the TPBi layer thicknesses were increased. These results indicated that the asymmetric thermal diffusion occurred.

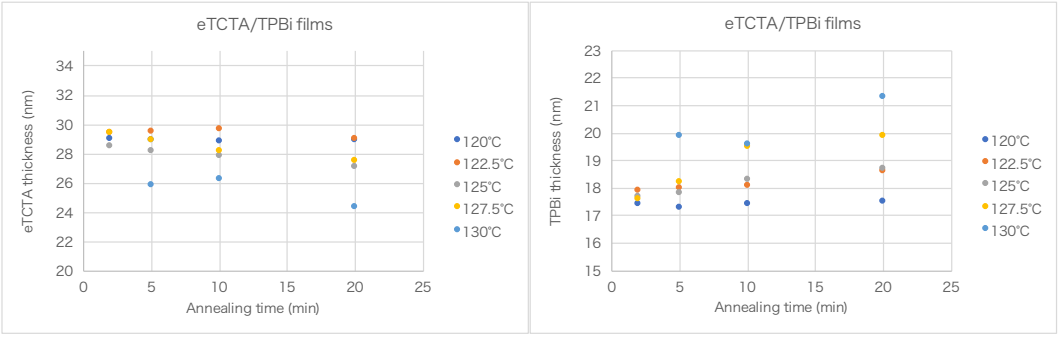

Figure 2. The layer thicknesses of eTCTA and TPBi layers.

Figure 3 shows the layer thicknesses of the sTCTA and TPBi layers in the sTCTA/TPBi films. After annealing at 120°C, 122.5°C, and 125°C, the thicknesses of each layer were not almost varied, suggesting the thermal diffusion was not occurred in these annealing conditions. At 127.5°C, smaller changes of the layer thicknesses were observed than those in the eTCTA/TPBi films. In contrast, at 130°C, much greater changes of the layer thicknesses were observed than those in the eTCTA/TPBi films. The film annealed at 130°C for 20 min was fully mixed. I considered that the difference in the thermal diffusion behavior was resulted from the film density between the eTCTA and sTCTA films. The denser eTCTA film made the thermal diffusion difficult.

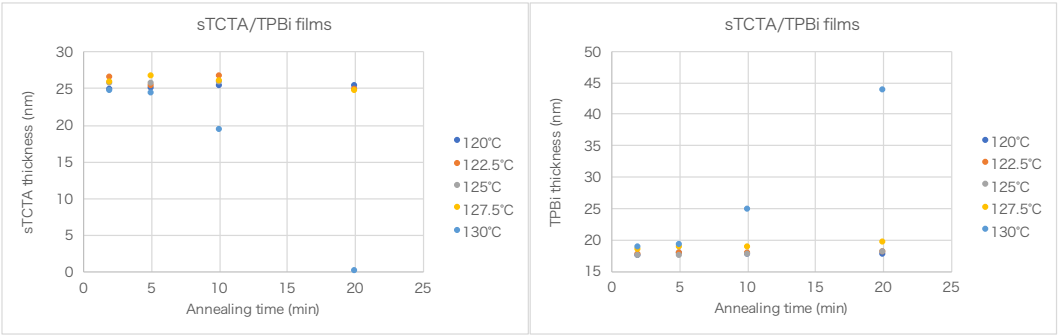

Figure 3. The layer thicknesses of sTCTA and TPBi layers.