Transfer Optimization of Inorganic Thin Film using Laser Lift-off

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Realizing high performance inorganic thin film on plastic substrates is extremely important for commercializing flexible display. There are several method to fabricate various inorganic thin film or TFT on flexible substrate, however, their performance is still insufficient compared to that of hard glass substrates. Our group designed new methodology to transfer high performance inorganic thin film, fabricated on glass substrate, to flexible substrate using laser lift off.

To transfer inorganic thin film from bulk to plastics, it is crucial to optimize energy density of laser irradiation from backside of glass substrates. Fig. 1 describes the transfer yield of inorganic thin film as laser energy density. As shown in Fig. 1, inorganic thin films begin to peeling-off from bulk substrate at laser energy density of 490 mJ/cm^2. At laser energy density of 510 mJ/cm^2, the transfer yield of inorganic thin film is highest. After that the transfer yield of inorganic thin film decreases linearly by increasing laser energy density.

The more laser energy density increases, the more thin film is on stress. So, when inorganic thin film is peeled-off, cracks occur at film surface. For reducing cracks, it is important that thin film is peeled-off at low laser energy density. The sacrificial layer on glass substrates is key factor of low energy laser lift-off. We can identify the decline of laser energy density that inorganic thin film can peel off, if we change the sacrificial layer to other diverse materials.

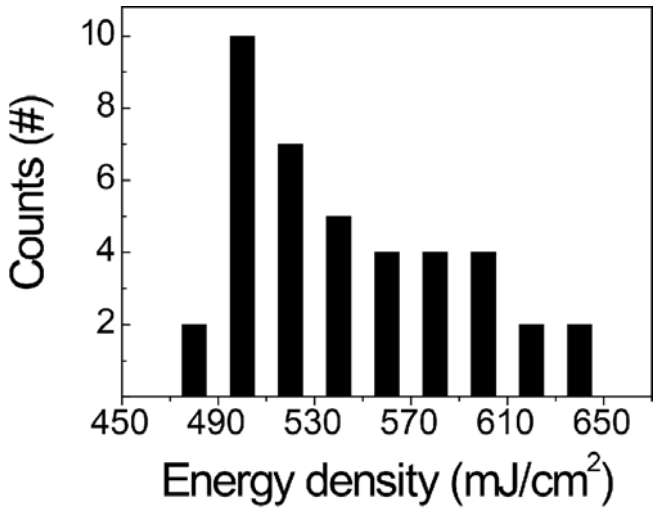

Fig. 1. Transfer yield of inorganic thin film as laser energy density.

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