

Non-Deterministic Transfer-Printing of LED Chips with Controllable Pitch Using Stretchable Elastomeric Stamps

이병주, 강달영[†]

연세대학교

(dykhang@yonsei.ac.kr[†])

Non-deterministic transfer printing of LED chips with controllable pitch has been demonstrated. An elastomeric stamp with pillar array, after picking up the corresponding array of chips, has been stretched and then the chip array was transfer-printed onto a receiver substrate, so that the pitch between chips can be controllably varied. The controllable pitch in the proposed non-deterministic transfer process can reduce the number of transfer down to 1/3 compared to other deterministic transfer techniques, which can greatly reduce the production time for full color LED displays. For the successful implementation of the process, stamp design has been optimized and verified by both experiments and finite element analysis. Specifically, pillar-patterned stamp has been found to reduce strain on pillar top down to 1/10 by the localization of applied strain onto inter-pillar regions. Further, re-entrant geometry of pillars can reduce the strain on pillar top by 1/10, leading to the protection of chips arrangement on pillared stamp upon very large stretching of 100~200%. Based on the developed non-deterministic transfer process, stretchable LED array has been successfully demonstrated.