Resist flow behavior analysis on UV imprint system using VOF algorithm

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Nanoimprint lithography as the next generation tool for sub-100nm patterns has advantages in micrometer pattern fabrication due to its low cost and simple process. The application of nanoimprint lithography to liquid crystal display (LCD) and organic light-emitting diode (OLED) fabrication was studied recently. However, it is difficult to produce a pattern without trapped air, which is a major defect in imprint process. To obtain a sound pattern with no trapped air, we need to know the mechanism by which air becomes trapped. With the UV imprint system, this is related to the pattern density, pattern size, resist viscosity, process pressure, and contact angle. Using the volume of fluid (VOF) algorithm, we simulated the formation of trapped air at a specific contact angle of the stamp and substrate, and found the conditions that eliminated the trapped air. We compared the simulation results with experiments.

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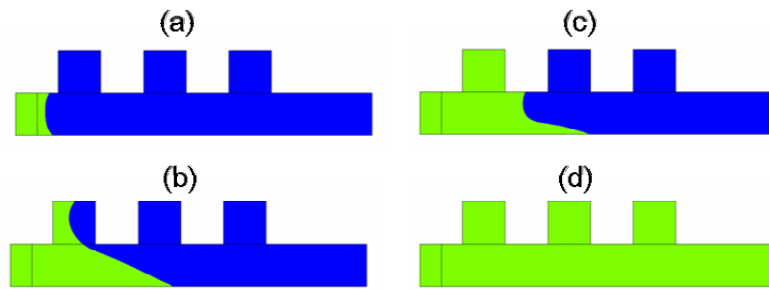 E-mail address : frontier@adpeng.com

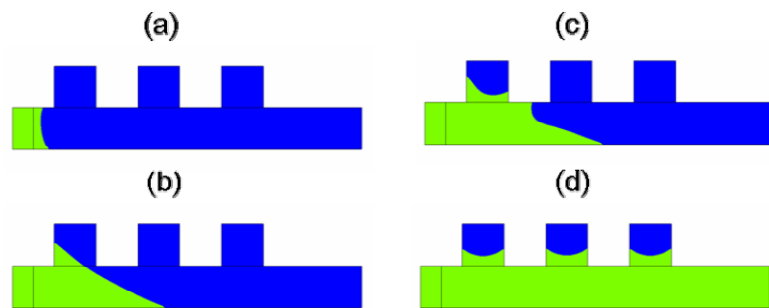Fig. 1 : The VOF simulation results (Stamp contact angle : 30°, substrate contact angle : 10°)

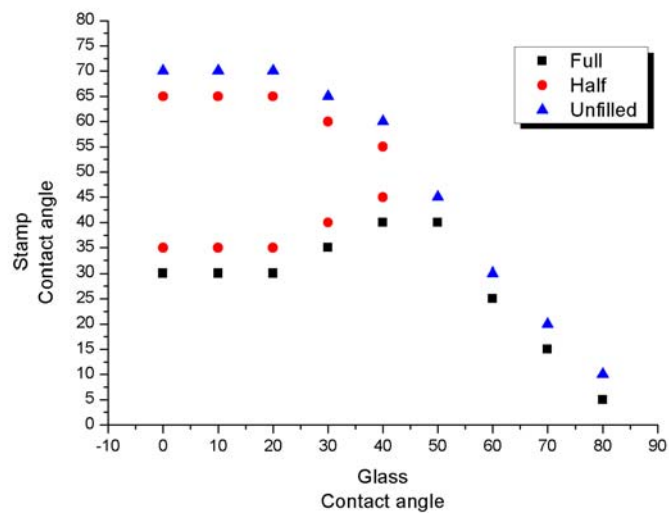Fig. 2 : The VOF simulation results (Stamp contact angle : 45°, substrate contact angle :10°)

Fig. 3 : The resist filling behavior at different contact angle