On-demand, Selective, Multi-batch, 3D Self-assembly for BioMEMS Packaging

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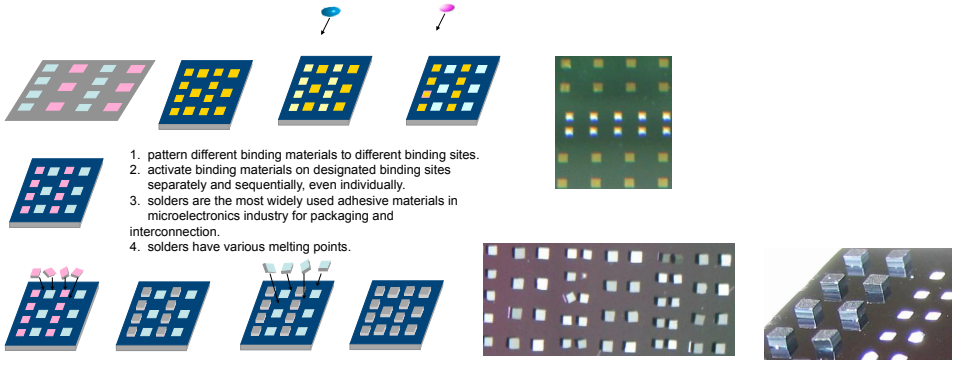
Self-assembly has been widely accepted as the next generation technology for integrating highly dense microelectromechanical systems (MEMS), in particular for complex and hybrid systems composed of sensing, actuating, optical, electronic, mechanical and fluidic components. In this study, a relatively simple and controllable method was developed to assemble multiple batches of micro components onto a single substrate in a liquid environment by surface tension force. In this method, solders with different melting points are patterned on desired binding sites on a substrate, and SU8 is used to mask binding sites for multi-batch solder applications. Binding sites can then be activated separately and sequentially by melting solders through increasing temperature of the liquid, such that the self-assembly becomes manageable.



The substrate with various binding sites was patterned with Karl Suss MA6 Mask Aligner;
SU8 covers was also patterned Karl Suss MA6 Mask Aligner;
Solder coverage and assembly process were carried out in heated DI water with a hotplate;
The assembled micro-parts (~200×200×500μm^3) were diced with the K&S 780 Dicing Saw.

References to publications from the work in nanofab:

1. Mei Liu, W. M. Lau, Jun Yang, On-demand multi-batch self-assembly of hybrid MEMS by patterning solders of different melting points, Journal of Micromechanics and Microengineering, Vol. 17(11), 2007, 2163-2168. (Featured Article)
2. Mei Liu, Jun Yang, Solder-directed self-assembly by different-melting-points and capillary forces for highly-integrated microelectronics/MEMS systems, International Conference on Soldering and Reliability, Toronto, Canada, 2008.
3. Mei Liu, Jun Yang, Controlled Multi-batch Self-Assembly of Micro-Parts onto Flexible Substrates by Patterning Solders of Different Melting Points, Canadian Society for Mechanical Engineers Forum, Ottawa, Canada, 2008.
4. Jinlong Zhang, Qiuquan Guo, Mei Liu and Jun Yang, A lab-on-CD prototype for high-speed blood separation, Journal of Micromechanics and Microengineering, Vol. 18, 2008, 125025 (6pp). (Highlights of Journal of Micromechanics and Microengineering in 2008)