Soft lithography for forming ceramic and nanocomposite microcomponents

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PROJECT DESCRIPTION:

This research is set up to extend MEMS fabrication technology from silicon to ceramics to suit the needs of high power MEMS devices. A group of new processes have been developed for fabrication of high precision ceramic and nanocomposite microcomponents using a combination of UV-lithography, soft lithography and colloidal powder processing. The properties of the high quality ceramic microcomponents have been characterized. The research has been extended to fabrication of homogenous ceramic nanocomposites and functional graded composite microcomponents with tailored properties and ceramic nanostructures.

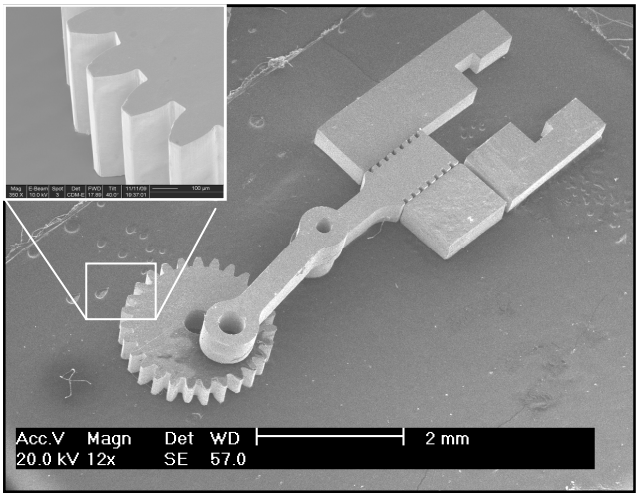

Figure 1. A ceramic micro combustion engine assembly[1].

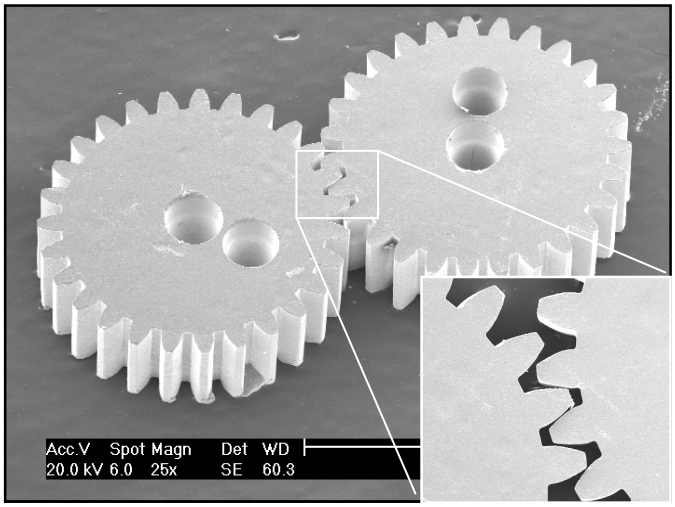

Figure 2. A pair of mashed ceramic Gears [2].

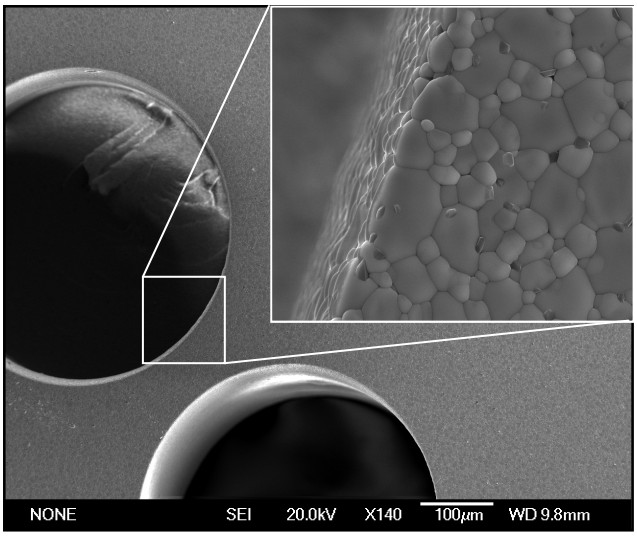

Figure 3. A microcomponent of Zirconia/Alumina Nanocomposite [3]

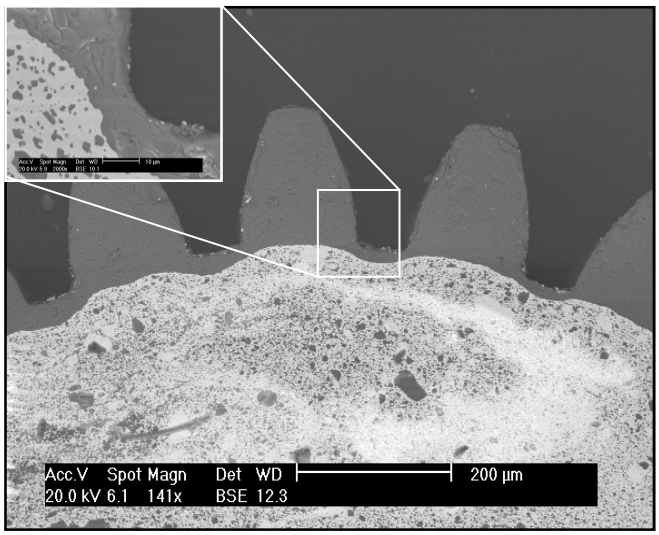

Figure 3. A functionally graded Zirconia/alumina microgear[4].

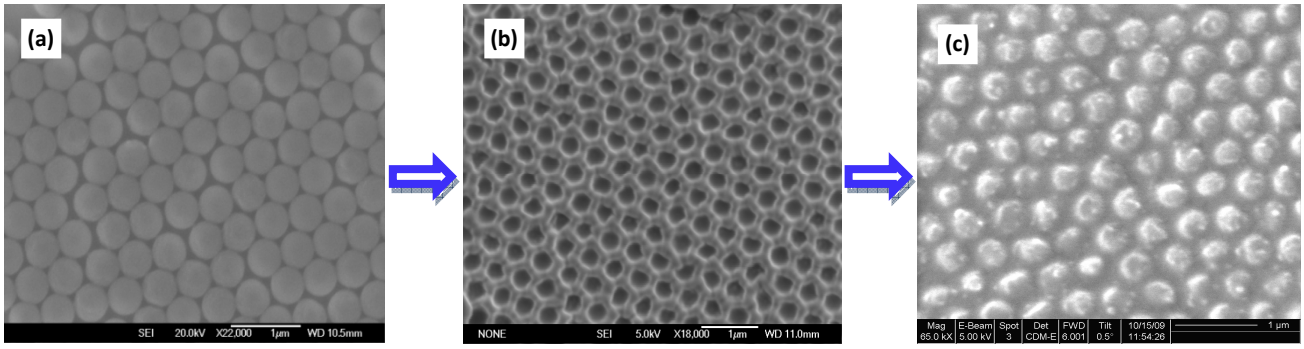

Figure 5. Ceramic Nanostructures fabricated in the group: (a) PS Nanospheres, (b) PDMS Nanoholes, (c) Ceramic Nanostructures.

Selected publications:

[1] H. Hassanin and K. Jiang, "Optimized process for the fabrication of zirconia microcomponents," Microelectronic Engineering, vol. 87, pp. 1617-1619, 2010.

[2] Zhigang Zhu, Hany Hassanin and Kyle Jiang, "A soft moulding process for manufacture of net-shape ceramic microcomponents," International Journal of Advanced Manufacturing Technology 47, 147-152, 2010.

[3] H. Hassanin and K. Jiang, “Fabrication of zirconia/alumina nanocomposite microcomponents using colloidal powder processing and soft lithography," The 36th International Conference on Micro & Nano Engineering (MNE 2010), Genoa, Italy, 19 September to 22 September 2010.

[4] H. Hassanin and K. Jiang, "Functionally graded microceramic components," Microelectronic Engineering, vol. 87, pp. 1610-1613, 2010.