

Nanosphere lithography : a flexible surface structuring process for MEMS and 3D parts

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Abstract

We report on the development and optimization of surface structuring processes based on nanosphere lithography. In this approach, micro and nanoparticles are being used as templates to manufacture structures with controlled lengthscales at the micro and nanoscale. When combined with other etching/deposition techniques it provides a cost-effective alternative to fabricate surface structures on a broad range of materials. A major strength of nanosphere lithography is its flexibility as the same process can be applied to very different case studies, on both planar and 3D substrates. Three examples of applications will be presented with the fabrication of silicon nanoporous membranes, the manufacturing of nanostructured LIGA parts and the surface structuring of 3D steel mold inserts.

In the first example, nanosphere lithography has been combined with standard MEMS processes to produce ultrathin SiN nanoporous membranes with pore size of 80nm. The process was optimized for 150mm wafers and the quality control was assessed by ellipsometry. For the second example, nanosphere lithography was combined with electroforming to produce nanostructured 3D microparts. Particles were deposited on a SU8 mold and successfully replicated into nickel. The sidewalls of microparts with features as small as 200µm was structured at a sub-microscale. In the last example, a large steel mold insert having a cylindrical shape was structured at a sub-microscale for injection molding application.

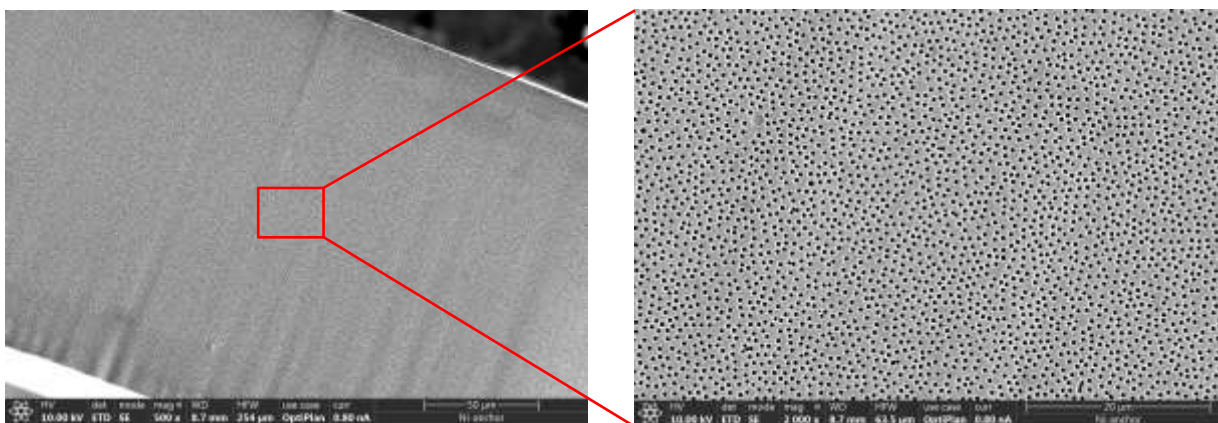


Figure 1: nanostructured LIGA part

