

Blazed Diffraction Gratings for a Miniaturized Spectrometer using X-ray Lithography

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The research involves the collaboration of the Jet Propulsion Laboratory and Louisiana State University (CAMD and ECE) and is working on the challenge to using grey scale X-ray lithography to produce blazed diffraction gratings on concave spherical surfaces in an effort to make compact and inexpensive spectrometers with high diffraction efficiency.

Using grey scale X-ray lithography, we have printed double blazed angle gratings on silicon wafers and glass discs coated with a thin X-ray resist. The grating profile is the same over lengths as long as 66 mm. The technique consists of scanning the substrate vertically with a mask that contains rows of pentagonal apertures. A vertical, constant-speed scan of the coated substrate relative to the X-ray mask (silicon nitride membrane with gold absorber) produces a periodic pattern on the substrate along the horizontal direction. We found that Micro-Chem PMGI-SF11 resist behaves linearly at high baking temperatures. An example of a grating profile acquired from a recent experiment is shown in Figure 1. The presentation will discuss details of the experimental setup and experiments and some latest results.

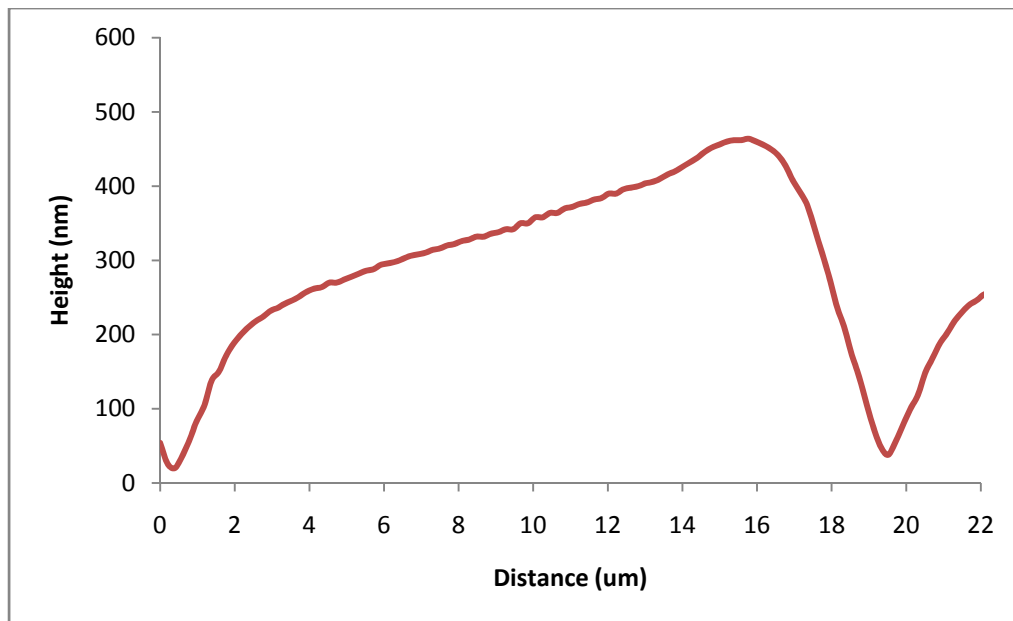


Figure 1: Periodic resist profile on a glass substrate. The first slope occurs for 2 μm and the second slope remains for the rest of the period resulting in the double blazed angle profile.