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Precision manufacturing using LIGA

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Our objective is the fabrication of small high precision parts using LIGA which can be used in a variety of industrial applications. LIGA is a combination of deep X-ray litho-graphy, electroplating, and replication processes that enables the fabrication of microstructures with vertical dimensions several millimeters high, lateral dimensions in the micrometer range , and submicron tolerances. On beamline 10.3.2, at the Advanced Light Source (ALS), the Center for X-ray Optics (CXRO) has built an endstation suitable for LIGA. The ALS is an excellent source of radiation for this application. CXRO in close collaboration with Sandia National Laboratory, and the Jet Propulsion Laboratory, has developed the other essential process steps of mask making, resist development, X-ray exposure, and electroplating. This technology provides a powerful tool for mass production and miniaturization of mechanical systems into a dimensional regime not accessible by traditional manufacturing operations. We will present several applications which exploit the characteristics of the LIGA process: the fabrication of magnetic laminations for a high precision stepping motor; miniature octopole lens for advanced e-beam lithography; high aspect ratio X-ray collimating grids for astronomy; and microscopic tumblers for nuclear security.