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Editorial for the virtual special issue on HEDP and ICF target fabrication

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Targets are an indispensable part of all inertial confinement fusion (ICF) and high-energy-density physics (HEDP) experiments: while a high-quality target does not guarantee the success of an experiment, a poor-quality one can definitely lead to failure. In ICF and HEDP experiments, the precision with which targets are fabricated is critical to obtaining successful results, and many cross-disciplinary scientific and technological challenges are involved in the fabrication process. These include the preparation of submillimeter-sized components with, in many instances, tolerances of tens to hundreds of nanometers, the assembly of these components with micrometer and sub-1000-arcsecond precision, and, finally, full characterization to confirm the dimensional tolerances. Worldwide, more and more researchers and groups are involved in the development of target fabrication techniques, and a great deal of progress has been made. This special issue of the journal *Matter and Radiation at Extremes (MRE)* on HEDP and ICF target fabrication consists of seven papers, covering the fabrication of target components, target assembly, and characterization.

Capsules play an essential role in ICF studies. In these experiments, the performance of a capsule when it is imploded is very sensitive to its spherical symmetry, since any perturbation to sphericity will be strongly amplified via ablative hydrodynamic instabilities that can ultimately lead to a failure to ignite. Thus, support of the capsule inside a hohlraum is an essential aspect of ICF target fabrication. In traditional methods, the target-supporting material is in partial contact with the capsule, and this has been shown in ignition experiments (at the National Ignition Facility in the USA) to cause a large perturbation to the imploding core. In this special issue, X. J. Li and his coauthors propose a magnetic-support method in their paper "A novel superconducting magnetic levitation method to support the laser fusion capsule by using permanent magnets" (https://doi.org/10.1016/j.mre.2018.01.004). This offers a potential solution for complete suppression of perturbations from the capsule support.

The capsule-fabrication process is both challenging and interesting. There are two papers in this special issue covering this subject. Based on a series of characterization techniques, the properties of capsules made via the glow-discharge polymerization method and emulsion microencapsulation techniques are reviewed by D. R. Harding and his coauthors in their paper "Properties of vapor-deposited and solution-processed targets for laser-driven inertial confinement fusion experiments" (https://doi.org/10.1016/j.mre.2018.08.001). In this paper, an overview of the defects of these two types of capsules is also presented. In their paper "Progress and challenges in the fabrication of DPS shells for ICF" (https://doi.org/10.1063/1.5081945), M. F. Liu and her coauthors describe the progress they have made in improving the quality of deuterated polystyrene (DPS) capsules from the viewpoint of synthesis and purification of DPS materials.

With regard to target characterization, in their paper "Characterization of supersonic and subsonic gas targets for laser wakefield electron acceleration experiments" (https://doi.org/10.1063/1.5081509), S. Lorenz and his coauthors demonstrate the use of their fluid-dynamic simulation in the prediction of the density profiles of gas targets in both the supersonic and subsonic regimes by benchmarking the results with experimental measurements. Yun Wang and his coauthors from the Beijing Institute of Technology present their achievements in characterizing the uniformity of the inner and outer radii and of the shell thickness of ICF capsules. In their paper "Measurement of laser differential confocal geometrical parameters for ICF capsule" (https://doi.org/10.1063/1.5085863), they present an approach for simultaneously acquiring several high-resolution geometrical measurements of capsules.

In their paper "Alignment of solid targets under extreme tight focus conditions generated by an ellipsoidal plasma mirror" (https://doi.org/10.1063/1.5088166), Deepak Kumar *et al.* describe a retro-imaging system for aligning a solid target to the tightly focused output from an ellipsoidal plasma mirror (EPM). In their paper "Target fabrication for laser-ion acceleration research at the Technological Laboratory of the LMU-Munich" (https://doi.org/10.1063/1.5081807), J. Szerypo *et al.* present an overview of the production of ultrathin foil targets in their laboratory. Their work on several kinds of foil targets ranging from 3 nm to 2000 nm is described and should be of great interest for those involved in laser proton/ion acceleration activities.

Every target has a story to tell regarding its fabrication, and all experiences of target fabrication are worth sharing. We hope that the rather nice papers in this special issue can arouse your interest and give you inspiration for your work on target fabrication.