Progress Towards Demonstrating IFE Target Fabrication and Injection

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High-gain target designs have been proposed for both laser-driven and heavy ion beam IFE power plants. Developing the technology to supply these targets represents a challenging multi-disciplinary optimization. Requirements are derived from considerations of target physics, materials fabrication, filling of the target with DT, layering of the DT fuel, target injection, costs, and environmental/safety concerns. The challenging scientific and technological issues associated with target fabrication and injection are being addressed with a significant development program. Since some materials employed in the target designs have not been previously fabricated, materials synthesis techniques are being developed or extended. An emphasis is being placed on methods that have the potential for extrapolation to high-volume production. Methods for filling and layering of the targets that handle very large quantities are being developed. Survival of the cryogenic target during acceleration and during its transit across the high-temperature target chamber is also an issue. A combination of thermal analyses, modeling, materials property measurements, and demonstration tests with representative injection equipment is being employed to demonstrate successful IFE plant fueling. This paper summarizes the requirements and critical issues for IFE target fabrication and injection, reviews the results from previous studies, discusses the development program now underway, and presents the current status of and results from that program.

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