Materials Selection for Heavy Ion Fusion Hohlraums

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Abstract. The hohlraum surrounds the fuel capsule in a Heavy Ion Fusion (HIF) target. The hohlraum absorbs ion beam driver energy and emits this energy uniformly around the capsule in the form of x-rays. High atomic number materials are necessary in the walls of the hohlraum to contain the x-ray energy around the capsule during the implosion process. These high atomic number hohlraum materials affect many aspects of a HIF power plant operation. A systematic review of available information for all high atomic number elements was conducted to select candidate hohlraum materials. Effect of materials on target fabrication, energy cost, target gain, radioactivity, chemical toxicity, and potential for recycle were considered. Lead and tungsten are the lowest cost acceptable materials in the primary coolant. The combination of Pb and W provide better target gain than either material alone. Seeding the primary coolant with submicron sized W particles can minimize W growth in small openings in power plant components such as vacuum tritium disengagers. Concerns remain for possible W particle agglomeration or erosion cause by tungsten particles. Several lanthanide elements could replace W if tungsten proves unacceptable.

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