High-Ti-concentration foams as laser-driven x-ray sources

J.D. COLVIN, Lawrence Livermore National Laboratory, F. PEREZ, J.R. PATTER-SON, M.J. MAY, J. EMIG, M.M. BIENER, A. WITTSTOCK, J.H. SATCHER, S.A. GAMMON, J.F. POCO, LLNL, S. FUJIOKA, Z. ZHANG, H. NISHIMURA, Osaka Univ., K.B. FOURNIER, LLNL — Metals between Ti and Ge are used for bright x-ray sources in the 4-10 keV range when irradiated by energetic nanosecond lasers. To maximize their laser-to-x-ray conversion efficiency (CE), lower density is preferred, achieved usually with pre-exploded thin foils or very-low-density foams (<10 mg/cm$^3$). We present recent experimental results using novel foams of high Ti concentration. Previous foams were doped with less than 5 at% of Ti. We manufactured two new types of foams with density ~ 5 mg/cm$^3$ and Ti concentrations 20 and 33 at%. They have been tested as x-ray sources in two laser facilities, OMEGA (USA) and GEKKO XII (Japan). CEs >5% are measured, significantly higher than previous achievements with the lower-concentration foams. We describe laser-heating dynamics simulation results and comparisons to time-resolved measurements, indicating strong differences between the several foams used.

This work was performed under the auspices of the U.S. Department of Energy by LLNL under Contract No. DE-AC52-07NA27344.

J. D. Colvin
Lawrence Livermore National Laboratory

Date submitted: 03 Jul 2013

Electronic form version 1.4