COMPREHENSIVE ANALYSIS OF IMPLOSION DYNAMICS OF Mo AND Al WIRE ARRAYS ARRANGED IN TRIPLE PLANAR OR NESTED CYLINDRICAL WIRE ARRAYS DEPENDENT ON LOAD GEOMETRY

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Triple Planar Wire Arrays (TPWA) consisted from three planes made of Mo (uniform) or from Mo and Al wire planes (combined). Each plane from Mo or Al wires was almost the same mass and therefore the total linear mass of both uniform and combined TPWAs was about 115 μg/cm. The previous results with 3 mm between planes are revisited. New experiments with the same TPWAs but with a reduced interwire gap of 1.5 mm that showed high yield of 25 kJ (close to the highest yield from Mo double planar wire arrays) are presented and analyzed. In addition, implosion dynamics and radiative properties of combined nested cylindrical wire arrays (NCWA) made of the same size Mo and Al wires (as in TPWAs) were compared with TPWAs, and similarity and differences are discussed. All experiments were performed on the Zebra generator at UNR. A set of diagnostics included fast, filtered x-ray diodes; a Ni bolometer; laser shadowgraphy and streak setups; time-gated and time-integrated x-ray pinhole cameras; and time-integrated spatially resolved (TISR) and time-gated spatially-integrated (TGSI) x-ray spectrometers. Implosion dynamics were analyzed with the wire ablation dynamics model. Non-LTE kinetic modeling was utilized to derive plasma electron temperature and density and to estimate opacity effects in K-shell Al lines. In particular, spatially resolved L-shell Mo plasma parameters were determined from TISR spectra. Time-gated (from TGSI data) and spatially-resolved (from TISR data) K-shell Al and Mg plasma parameters were modeled. In result, a comprehensive analysis and comparison of L-shell and K-shell plasma parameters for TPWAs with different geometries as well as for NCWAs was accomplished. Future directions of this work are discussed.

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