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Structure and Characteristics of a Spherical Plasma Focus: Theory and Simulation YASAR AY, North Carolina State University, Department of Nuclear Engineering, Raleigh, NC 27695, USA, MOHAMED A. ABDAL-HALIM, Benha University, Faculty of Science, Department of Physics, 13518 Benha, Egypt, MOHAMED BOURHAM, North Carolina State University, Department of Nuclear Engineering, Raleigh, NC 27695, USA — Most studies of dense plasma focus devices use cylindrical coaxial shapes, however, a spherical shape is investigated herein. Snow plow model and shock wave equations are coupled with the circuit equations to model the spherical plasma focus. Of interest in spherical plasma focus is to have both sheath expansion and the magnetic pressure changing rate for the rundown phase instead of the constant sheath only for the cylindrical case. The developed model is compared to published experimental results for validation and good agreement was obtained. Hydrogen and its isotopes were separately used for investigating the effect of the different molecular weights on plasma parameters. The gas pressure and discharge voltage were varied for these gases to study their effect on the plasma parameters. The study predicts a peak discharge current of 1.5MA for tritium with 0.92MA dip discharge current, and less for deuterium and hydrogen. The current drop for tritium indicates focus action. It indicates that the sheath velocity for heavy gases is lower than lighter gases. Predicted maximum temperature variation is about 11.1eV for hydrogen, 14.6eV for deuterium, 15.9eV for DT mixture and 17eV for pure tritium; which indicates higher temperature with heavier gasses.

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