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Simulation of atmospheric pressure plasma jet with coaxial shielding gas PENG LIN, TAM NGUYEN, VINCENT DONNELLY, DEMETRE ECONOMOU, University of Houston — Atmospheric pressure plasma jets (APPJ) operated in open air are subject to changes in air conditions (e.g., humidity). A coaxial shielding gas (SG) can be used to curb air contamination and provide a controlled operating environment. A fluid model was used to simulate an APPJ with He, N_2 and synthetic air as the working, shielding and ambient gas, respectively, with O_2 considered the "contaminant." The plasma was powered by a 13.56 sinewave at 2.25 kV peak. Base flow rates were 2 and 4.5 slm for He and N_2, respectively. The shielding ratio was defined by SR = (O_2 concentration with SG)/(O_2 concentration without SG). A lower SR reflects better shielding. SR was found to decrease with increasing SG flow rate, implying less contamination of the plasma jet. The on-axis SR showed more complex behavior as a function of distance (z) from the nozzle. SR started with a value of unity, then it dropped at z=2 mm, and then increased gently to SR=0.2 at z=16 mm. Further results on the effect of flow rate of the working and shielding gases are of primary interest. Simulation predictions compare favorably with experimental data from the open literature and from our own laboratory.

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