Abstract Submitted
for the GEC20 Meeting of
The American Physical Society

Novel Industrial Scale Radio Frequency Inductively Coupled Plasma Torch PATRICK MIREK, SINA ALAVI, JAVAD MOSTAGHIMI, Center for Advanced Coating Technologies, University of Toronto, CENTER FOR ADVANCED COATING TECHNOLOGIES TEAM — A novel industrial-scale radio-frequency inductively coupled plasma (RF-ICP) torch design is proposed which uses a conical geometry, with the goal of reducing gas & power consumption and increasing powder spheroidization efficiency. The investigation was conducted using the ANSYS Fluent software, by simulating the injection of powder particles into the plasma discharge produced by the RF-ICP torch. The simulations use an in-house numerical model which was developed to account for the electromagnetic phenomena. The simulations are used to optimize the conical torch and compare its performance to a conventional RF-ICP torch. It was found that the new conical torch achieves spheroidization ratios up to 2 times higher than the conventional torch, due to 3x higher axial temperatures and an induction zone closer to particles. Additionally, it runs at 42% lower gas consumption and can achieve industrially acceptable spheroidization ratios at half the power level of the conventional torch. In industrial applications, this new conical torch can provide significant savings in cost, gas, and power, while increasing processing speeds and improving the quantity of processed powder particles.

Patrick Mirek
Center for Advanced Coating Technologies, University of Toronto

Date submitted: 12 Jun 2020 Electronic form version 1.4