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Progress in Development of C_{60} Nanoparticle Plasma Jet for Diagnostic of Runaway Electron Beam-Plasma Interaction and Disruption Mitigation Study for ITER[1] I.N. BOGATU, J.R. THOMPSON, S.A. GALKIN, J.S. KIM, FAR-TECH, Inc. — We produced a C_{60} nanoparticle plasma jet (NPPJ) with uniquely fast response-to-delivery time ($\sim 1-2$ ms) and unprecedentedly high momentum ($\sim$ 0.6 g·km/s). The C_{60} NPPJ was obtained by using a solid state TiH_2/C_{60} pulsed power cartridge producing ∼180 mg of C_{60} molecular gas by sublimation and by electromagnetic acceleration of the C_{60} plasma in a coaxial gun (∼35 cm length, 96 kJ energy) with the output of a high-density ($>10^{23}$ m^{-3}) hypervelocity (>4 km/s) plasma jet. The $\sim$ 75 mg C_{60}/C plasma jet has the potential to rapidly and deeply deliver enough mass to significantly increase electron density (to $n_e \sim 2.4 \times 10^{21}$ m^{-3}, i.e. $\sim$ 60 times larger than typical DIII-D pre-disruption value, $n_{e0} \approx 4 \times 10^{19}$ m^{-3}), and to modify the 'critical electric field' and the runaway electrons (REs) collisional drag during different phases of REs dynamics. The C_{60} NPPJ, as a novel injection technique, allows RE beam-plasma interaction diagnostic by quantitative spectroscopy of C ions visible/UV line intensity. The system is scalable to $\sim 1-2$ g C_{60}/C plasma jet output and technology is adaptable to ITER acceptable materials (BN and Be) for disruption mitigation.

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