Abstract Submitted
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Runaway dynamics in ITER-like disruptions in the presence of massive material injection[1] OSKAR VALLHAGEN, OLA EMBREUS, ISTVAN PUSZTAI, LINNEA HESSLOW, TÜNDE FÜLÖP, Chalmers University of Technology — A runaway avalanche can result in a conversion of the initial plasma current into a relativistic electron beam in high current tokamak disruptions. We investigate the effect of massive material injection of deuterium-noble gas mixtures on the coupled dynamics of runaway generation, resistive diffusion of the electric field, and temperature evolution during disruptions in ITER-like plasmas. We explore the dynamics over a wide range of injected concentrations and find substantial runaway currents, unless the current quench time is intolerably long. The reason is that the cooling associated with the injected material leads to high induced electric fields that, in combination with a significant recombination of hydrogen isotopes, leads to a large avalanche generation. Balancing Ohmic heating and radiation losses provides qualitative insights into the dynamics, however, an accurate modeling of the temperature evolution based on energy balance appears crucial for quantitative predictions.

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