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Divertor Power Exhaust with Impurity Powders in DIII-D[1] FLORIAN EFFENBERG, ALESSANDRO BORTOLON, ROBERT LUNSFORD, RAJESH MAINGI, ALEXANDER NAGY, PPPL, HEINKE G. FRERICHS, UW, JEREMY D. LORE, ORNL, IGOR BYKOV, UCSD, LIVIA CASALI, GA, MAX E. FENSTERMACHER, FILIPPO SCOTTI, LLNL, HUIQIAN WANG, GA, YUHE FENG, IPP, BRIAN A. GRIERSON, FLORIAN LAGGNER, RAFFI NAZIKIAN, PPPL, DAN M. THOMAS, GA, DIII-D TEAM — DIII-D experiments in upper-single-null ELMy H-mode plasmas demonstrate that injection of low-Z materials in particulate form can effectively enhance dissipation in a closed divertor configuration. A rapid reduction of the downstream electron temperature, ion flux and heat flux was measured in the small-angle slot divertor as a result of local injection of lithium, boron, and boron nitride powder, in 2-s intervals at constant rates of 1-50 mg/s. BN injection led to a substantial increase of near-target neutral pressure and a transition to strike-point detachment with only a 2-15% degradation in global energy confinement. 3D modeling with EMC3-EIRENE supported by spectral divertor imaging measurements is used to analyze the radiative losses within the divertor plasma. While Li radiation is concentrated near the separatrix, N radiative losses occur in the main scrape-off layer, and the B peak emission front is located in the far SOL. B and N are about an order of magnitude more efficient radiators than Li.

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