Initial Boron Powder Injection Experiments in WEST

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Impurity powder droppers (IPDs) have been installed on a number of tokamaks and stellerators around the world to evaluate the viability of powder injection for real-time wall conditioning. Boron powder (< 150 μm) was injected at various drop rates into lower single null L-mode plasmas in WEST, using a recently installed IPD developed at PPPL, with the objective of improving wall conditioning to facilitate H-mode access. These pulses featured I_p = 0.5 MA, t_{pulse}= 12-30 s, n_e = 4x10^{19} m^{-3}, and P_{LHCD} = 3.0-4.5 MW. B powder was continuously dropped into WEST plasmas for up to 16.5 s, demonstrating the viability of powder injection on long pulse time scales. During powder injection, visible spectroscopy diagnostics showed a clear reduction in D-I, C-II, O-II, and N-II line intensities, suggesting a reduction in recycling and possible screening of low-Z impurities in the SOL. W-I line intensity was observed to increase in the lower divertor region, but decrease at the outboard ICRH limiter. C, O, and N line intensities appeared to decrease as more B powder was injected, possibly indicating a cumulative wall conditioning effect. These WEST experiments have also observed transient improvements in confinement during powder injection, where a 25% increase in stored energy occurred for ~ 400 ms even though I_p and P_{LHCD} did not change over this period.