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First results from boron and boron nitride powder injection in LHD FEDERICO NESPOLI, Princeton Plasma Physics Laboratory, NAOKO ASHIKAWA, National Institute for Fusion Science, ERIK P. GILSON, ROBERT LUNSFORD, PPPL, SUGURU MASUZAKI, MAMORU SHOJI, TETSUTAROU OISHI, CHIHIRO SUZUKI, NIFS, ALEX NAGY, ALBERT MOLLEN, NOVIMIR A. PABLANT, PPPL, KATSUMI IDA, GAKUSHI KAWAMURA, MIKIROU YOSHINUMA, NAOKI TAMURA, NIFS, DAVID A. GATES, PPPL, TOMOHIRO MORISAKI, NIFS, THE LHD EXPERIMENT GROUP TEAM — Sub-millimeter powder grains of boron and boron nitride are injected for the first time in the Large Helical Device plasma, employing the Impurity Powder Dropper, developed and built by PPPL. Cross- diagnostics measurements show the injected impurities to effectively penetrate into the plasma, as the injection rate and plasma density are varied. The injected impurities provide a supplemental electron source, causing the plasma density and radiated power to increase. For $n_{e,av} < 10^{19} m^{-3}$ the powder grains penetrate deeper into the plasma, as they can be less effectively deflected by the plasma flow in the divertor leg, which they have to cross first as they are injected from the top of the machine. In this case, the created boron ions are observed to move outwards from UV spectroscopy and charge exchange measurements, due to the direction of the ambipolar radial electric field, while this is not the case for higher density plasmas. Low density plasmas are therefore better candidates for powder boronization techniques. The experimental observations are supported by numerical results from the codes SFINCS and EMC3-EIRENE coupled with DUSTT.

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