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Overview of Final CDX-U Experiments with Lithium Plasma-Facing Components[1] R. KAITA, R. MAJESKI, T. GRAY, H. KUGEL, D. MANSFIELD, J. SPALETA, J. TIMBERLAKE, L. ZAKHAROV, PPPL, R. DOERNER, T. LYNCH, UCSD, R. MAINGI, ORNL, V. SOUKHANOVSKII, LLNL — The final phase of Current Drive eXperiment Upgrade (CDX-U) research involved plasma-facing surfaces nearly completely coated with lithium. The CDX-U device is a spherical tokamak with the following typical parameters: R=34 cm, a=22 cm, B_t=2 kG, I_p=100 kA, $T_e(0)$=100 eV, and $n_e(0)$=5x10^{19} m^{-3}. Electron beam-induced evaporation from a lithium target and vapor deposition from a lithium-filled oven created lithium coatings. Convective flows for highly-efficient power dissipation were observed in the lithium with electron beam heating. Lithium layers up to 100 nm thick between were deposited between discharges. These coatings reduced global recycling coefficients to as low as 0.3, a record for magnetically-confined hydrogen plasmas. New magnetic diagnostics constrained equilibrium reconstructions that were used to determine energy confinement times. With lithium coatings, plasmas had the largest global confinement enhancement ever achieved in an Ohmically-heated tokamak, exceeding ITER98P(y,1) scaling by up to a factor of three.

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