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ACTIVE RECYCLING CONTROL THROUGH LITHIUM INJECTION IN EAST

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The coating of tokamak walls with thin layers of lithium has been demonstrated to reduce plasma recycling from the plasma-facing surfaces, and to improve overall plasma performance [1]. These effects, including reduced divertor D emission, the elimination of edge-localized modes, and increased energy confinement have been observed in multiple experiments when lithium coatings are applied before plasma discharges. However, this coating technology does not extrapolate to future long-pulse devices, since the lithium coatings will be passivated by the continual plasma flux onto the surface. In order to provide active conditioning capability, a new technology has been developed that is capable of injecting lithium powder into the scrape-off layer plasma during plasma discharges, where it quickly liquefies and turns into an aerosol [2]. The use of this "lithium dropper"is under study at the EAST tokamak, where the potential benefits of real-time wall conditioning lithium injection are being tested.
Here we present an analysis of the recycling characteristics during EAST experiments testing active lithium injection in order to assess recycling reduction and control. Lithium aerosol was injected from the top of the machine, with one system dropping lithium near the X-point and another into the low-field side divertor leg. Lithium coatings applied via evaporation were applied at the beginning of the run day, and active lithium injection was intended to refresh the lithium layer later in the day after the original coatings were largely consumed. The injection of lithium into the SOL was reduced divertor recycling, as evidenced by reduced D emission with ion flux measured by probes relatively unchanged. This effect is strongest in the divertor leg nearest the lithium dropper, becoming more pronounced with higher lithium injection rates. Quantitative analysis of the recycling changes during is underway using the SOLPS edge plasma and neutral transport code [3,4]. The assessment of the impact of lithium injection on divertor recycling coefficient and details of the dropper technology, and possible near term upgrades, will be presented.
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Eligible for student paper award?

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