

## Lithium Ion Sources

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A lithium ion beam is attractive as it requires lower energies than other widely used ions, such as  $K^+$ ,  $Cs^+$ ,  $Na^+$ , to transport up to the targets for warm dense matter studies. Recently, a 10.9 cm diameter lithium ion source has been chosen as a source of  $\approx 100$  mA lithium ions for Neutralized Drift Compression Experiment (NDCX-II) at LBNL. In general, the common usage of lithium ion beams in magnetically confined fusion experiments for plasma diagnostics. R & D was carried out prior to NDCX II source design. A space-charge-limited emission with current densities exceeding  $1 \text{ mA/cm}^2$  was measured from 0.64 cm diameter lithium aluminosilicate ion sources when operating at  $\sim 12750\text{C}$ . The lifetime of a thin coated (on a tungsten substrate) lithium aluminosilicate source was varied within 40 to 100 hours when pulsed at 0.05 Hz and with pulse length of  $\sim 6 \mu\text{s}$  each, i.e., a duty factor of  $3 \times 10^{-7}$ , at an operating temperature of 1250 to  $12750\text{C}$ . This lifetime variation could be due to the variation of amount of lithium aluminosilicate mass deposition on the substrate surface. This article describes preparation of lithium  $\beta$ -eucryptite compound, typical current density and the lifetime. NDCX-II 10.9 cm diameter source performance will also be addressed as we progress in commissioning the NDCX-II machine.

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