Carrier density control and phase diagram of Li$_x$ZrNCl superconductors YASUJIRO TAGUCHI, ATSUSHI KITORA, YOSHIHIRO IWASA, Institute for Materials Research, Tohoku University — We succeeded in synthesizing a series of Li$_x$ZrNCl samples with controlled doping level $x$ ($0 \leq x \leq 0.3$) which are confirmed to be of single phase by means of synchrotron x-ray diffraction measurements. We found that $T_c$ rapidly increases upon reducing Li concentration below $x=0.12$ to reach the maximum value of 15.2 K at $x=0.06$, and that a superconductor-to-insulator transition (SIT) is encountered at $x=0.05$ due to the Anderson localization effect. Such an increase in $T_c$ on the verge of SIT seems to be difficult to explain by the conventional theory, but may be indicative of the charge fluctuation contribution to superconductivity in low-carrier-density systems.