Mitsuru Itoh Lab

Ultra-high speed rechargeable Li-ion battery

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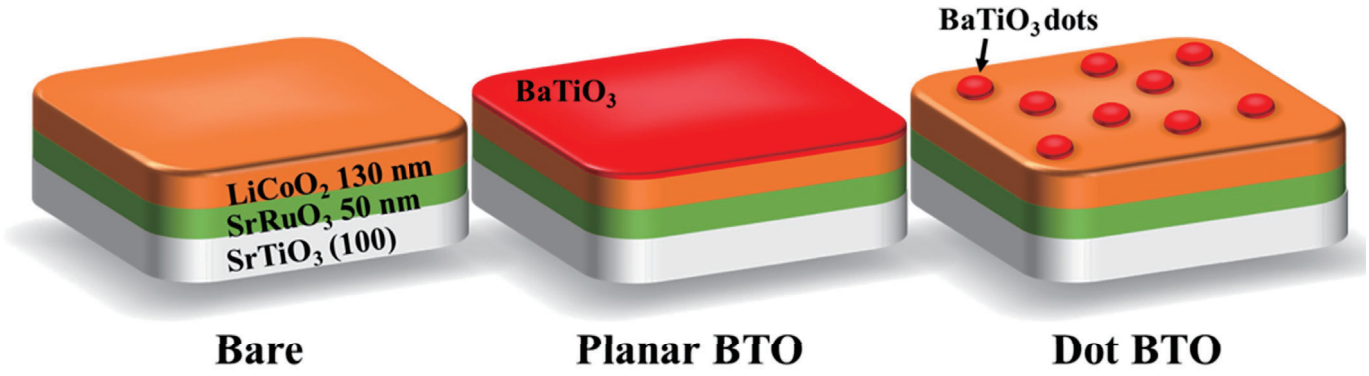
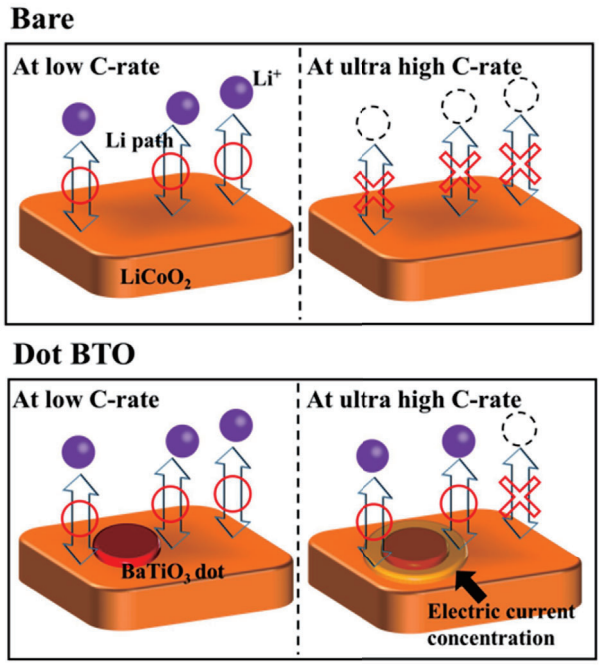
- Over half capacity chargeability less than one minute
- Quantitative analysis of interface reaction
- Suppression of side reaction around Triple-phase interface



Modeled structures of $LiCoO_2$ cathode system in Li-ion battery

Three cathodes were fabricated: a standard bare one (left), one coated with a layer of $BaTiO_3$ (middle), and one coated with several $BaTiO_3$ nanodots (right). The one with the nanodots exhibited greatly enhanced performance.

Nowadays, modern advances in electrical devices and vehicles have created the need for even better batteries in terms of stability, rechargeability, and charging speeds. While Li-ion batteries (LIBs) have proven to be very useful, it is not possible to charge them quickly enough with high currents without running into problems such as sudden decreases in cyclability and output capacity owing to their intrinsic high resistance and unwanted side reactions. The formation of a solid electrolyte interface is greatly suppressed near the triple interface($LiCoO_2$-$BaTiO_3$-electrolyte), which would otherwise result in poor chargeability and cyclability. This result realizes to very quick rechargeable and also very tough cycle battery.



Effect of $BaTiO_3$ nanodots

The $BaTiO_3$ nanodots concentrate electric current in a ring around them and create paths through which Li ions can pass, even at really high charge/discharge rates.