

## Development of a Novel Energy Storing Device Using a MoO<sub>2</sub> Anode and Graphite Cathode

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Nowadays, research on capacitors and Lithium Ion Batteries (LIBs) has attracted great attention due to its potential applications as energy storing devices in many fields. Due to some of the drawbacks of existing capacitors and LIBs, we have developed a novel energy storing device using graphite based cathode and metal oxide based anodes [1-2]. Following this concept, a novel cell was developed using a molybdenum (IV) oxide anode and a KS-6 graphite cathode. It was revealed that during the charging process, the PF<sub>6</sub><sup>-</sup> anions intercalated to interlayer spaces of KS-6 graphite while Li<sup>+</sup> intercalate into MoO<sub>2</sub>. The energy storage system was tested in different voltage regions and found that best cut-off voltage is in between 1.5-3.5 V. During the charging process, the ceiling potential of graphite researchers to 5.2 V vs. Li/Li<sup>+</sup>. This potential is well above the traditional metal oxides used as LIB cathode materials. The charge discharge mechanism of the cell was elucidated by *x-situ* XRD data and the analysing of the potentials of each electrode using a 4-electrode cell. It was also revealed that the developed system could be used only the lithium salt as sole source of lithium ions which reduces the safety issues common LIBs.

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### References

1. N. Gunawardhana, G.-J. Park, N. Dimov, A. K. Thapa, H. Nakamura, H. Y. Wang, T. Ishihara and M. Yoshio, Constructing a Novel and Safer Energy Storing System Using a Graphite Cathode and a MoO<sub>3</sub> Anode, *J. Power Sources*, 2011, **196** (18), 7886-7890.
2. G. Park, N. Gunawardhana, C. Lee, S.-M. Lee, Y.-S. Lee and M. Yoshio, Development of Novel and Safer Energy Storing System Using a Graphite Cathode and a N<sub>2</sub>O<sub>5</sub> Anode, *J. Power Sources*, 2013, **236**, 145-150.