Engineering van der Waals gap of MoO_3 to achieve high-kinetics anode for dual-ion energy storage devices

Minghao Yu, Xinliang Feng*
Technische Universität Dresden, Mommsenstr. 4, Dresden, Germany
Minghao.yu@mailbox.tu-dresden.de

To mitigate the trade-off between energy density and power density has been considered as a big challenge for electrochemical energy storage devices. [1, 2] In this regard, developing high-capacity ion-intercalation electrode with high kinetics is highly desirable. [3, 4] Here, we fabricated a novel α-MoO_3 electrode with widely expanded van der Waals gaps, which is induced by a facile H_2O-incorporation strategy. The incorporated H_2O molecules are demonstrated to be located at the oxygen vacancy sites of [MoO_6] octahedra layer, which results in the significant increase of the b-lattice parameter of α-MoO_3 by 1.2 Å. Compared with pristine α-MoO_3 electrode, the modified electrode shows greatly improved Li^+ storage kinetics with remarkably enhanced rate performance, and prolonged cycling stability. Furthermore, a full dual-ion-intercalation energy storage device was assembled by coupling this α-MoO_3 anode with graphite cathode. Impressively, the device presents battery-level energy densities with supercapacitors-level power densities.

References

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[3] Ji B, Zhang F, Song X, Tang Y. *Adv. Mater.*, 29, (2017), 1700519.
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Figures

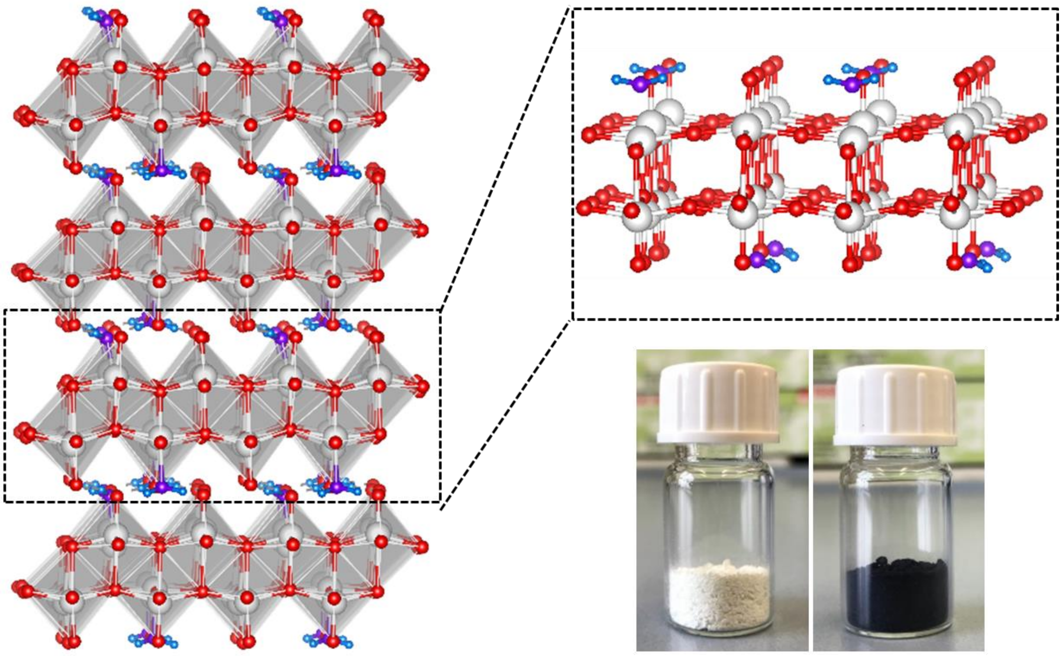

Figure 1: Scheme illustrating the structure of α-MoO_3 with expanded vdW gaps induced by H_2O incorporation.