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Investigation of the working mechanism in the Graphene-Aluminum ion Battery ANTHONY CHILDRESS, JINGYI ZHU, RAMAKRISHNA PODILA, APPARAO RAO, Clemson University, Department of Physics and Astronomy and Clemson Nanomaterials Institute — The need for "beyond lithium" systems has renewed interests in aluminum-ion batteries. It was recently discovered that few-layer graphene (FLG) can serve as an intercalation medium for aluminum tetrachloride anions, allowing it to be used as a cathode material in Al-ion batteries. The cells made with the pristine and defect-engineered FLG cathodes and aluminum anode have stable discharge plateaus with energy and power densities as high as 275 kWh/kg and 3500 kW/kg and a stable cycling performance of up to 7,000 cycles, providing a promising alternative to state-of-the-art Li-ion batteries. In the work to be presented, we elucidate the fundamental mechanism underlying Al-ion transport and redox reactions through in-situ Raman spectroelectrochemistry.

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