

## Supplementary Information

### **Induced Orbital Asymmetry of Nonpolar Molecular Additives for Boosted Rapid Operating Performance in Lithium Metal Batteries**

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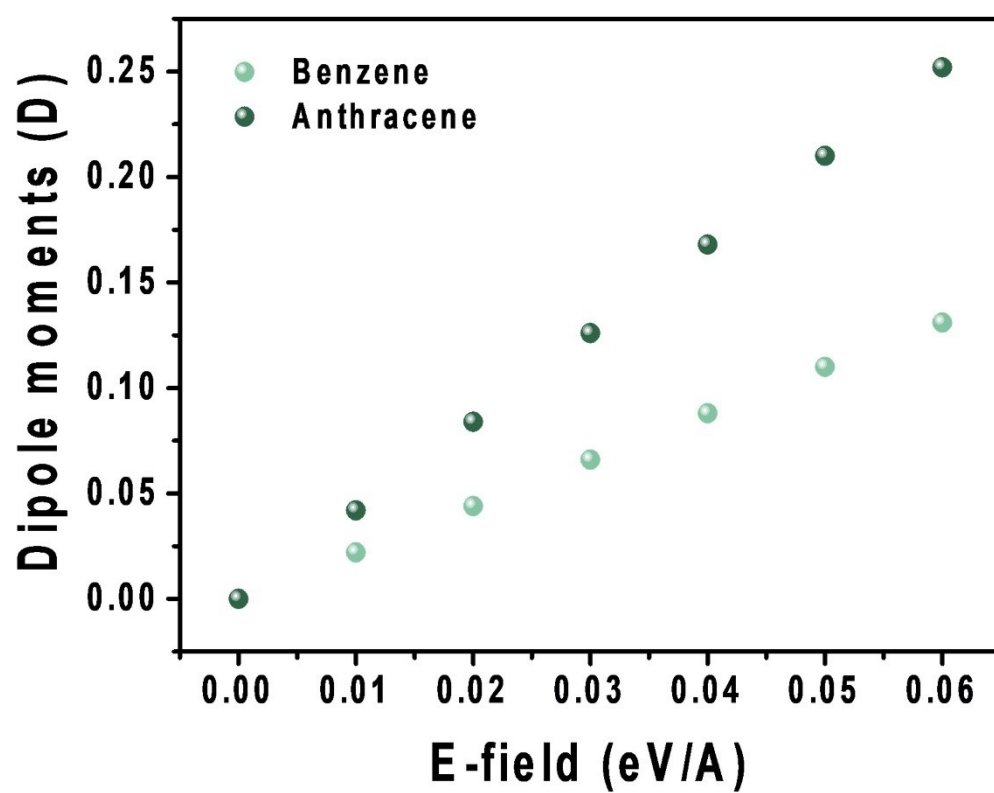
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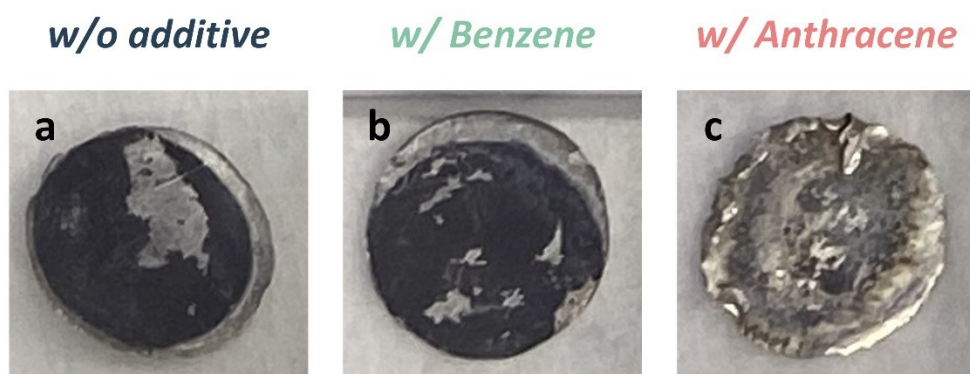
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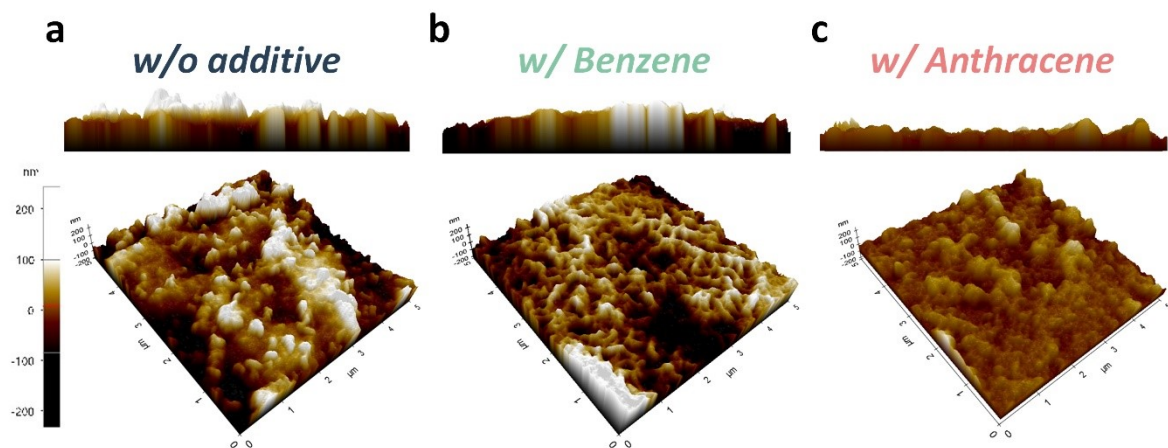
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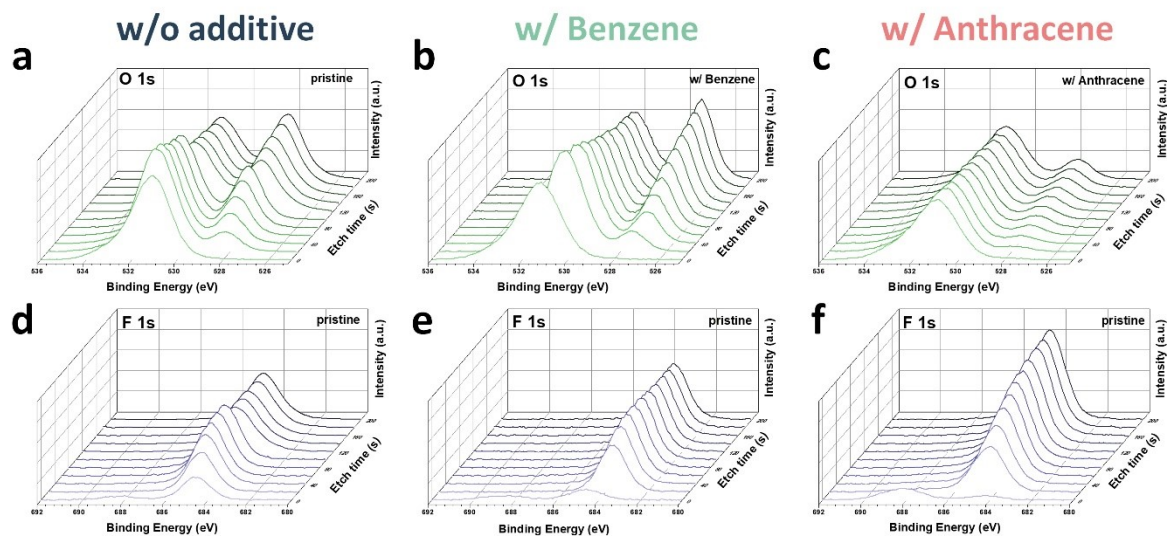
**Figure S1.** Graph of the calculated dipole moments of benzene and anthracene increasing with the E-field.



**Figure S2.** Digital images of the lithium metal anode from the disassembled Li–Li symmetric cells prepared (a) without additive, (b) with benzene, and (c) with anthracene.



**Figure S3.** AFM images of the lithium metal electrode in the electrolyte (a) without additive, (b) with benzene, and (c) with anthracene.



**Figure S4.** XPS depth profile results after 30 cycles. XPS depth profiles for O 1s using electrolyte (a) without additive, (b) with benzene, and (c) with anthracene. XPS depth profiles for F 1s using electrolyte (d) without additive, (e) with benzene, and (f) with anthracene.