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Hybrid biopolymer electrodes for lithium- and sodium-ion batteries in organic electrolytes

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The use of earth abundant and renewable materials is encouraging for the future development of environmentally clean, safe and affordable electrodes for lithium- and sodium-ion batteries. Biohybrid electrodes based on lignin and several conducting polymers have been studied mainly for supercapacitor applications. Here, we show that biohybrid electrodes containing natural lignin and PEDOT conjugated polymer serve as electroactive materials for lithium- and sodium-ion half cells using liquid organic electrolytes. Reversible discharge capacities of 74 mAh.g⁻¹, at C/20 (4 mA.g⁻¹) rate, were achieved in the voltage range between 1 V to 4.5 V, with peak values of up to 159 mAh.g⁻¹. These properties make natural lignin-PEDOT hybrid material a suitable organic positive electrode in Li- and Na-ion batteries.