

Abstract Submitted
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Toward better Li-ion batteries: hard x-ray photoelectron spectroscopy investigation of binder materials for Si-based anodes¹ BENJAMIN YOUNG, Rhode Island Coll, DAVID HESKETT, CAO CUONG NGUYEN, University of Rhode Island, JOSEPH WOICIK, NIST, BRETT LUCHT, University of Rhode Island — From portable electronics to space exploration, the desire for more capable rechargeable batteries is driving a search for high capacity anodes. There is much interest in incorporating silicon as a partial or full replacement for the current graphite material in the most popular batteries because it could potentially hold much more charge. There is a significant challenge, however, in that storing so much more lithium in either electrode as the battery is charged and discharged as this causes an accompanying increase in the physical size fluctuation of the electrodes. Specifically, in the anode where this investigation focuses, the active material may experience a 300% volume change between the charged and discharged state. This makes a long lifetime difficult to achieve because the passivation layer protecting the electrolyte material from decomposition is compromised upon each cycle. One approach to accommodating the large volumetric fluctuation without sacrificing lifetime is to find a better material to include in the anode substrate to act as a binder. Ideally, such a material would permit the anode to fluctuate without breaking. Polyvinylidene fluoride (PVdF) is not successful for silicon-based anodes and we present Hard X-ray photoelectron spectroscopy studies of batteries incorporating three alternatives. The alternative binders outperform the PVdF and we present possible explanations.

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