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Dear Editor,

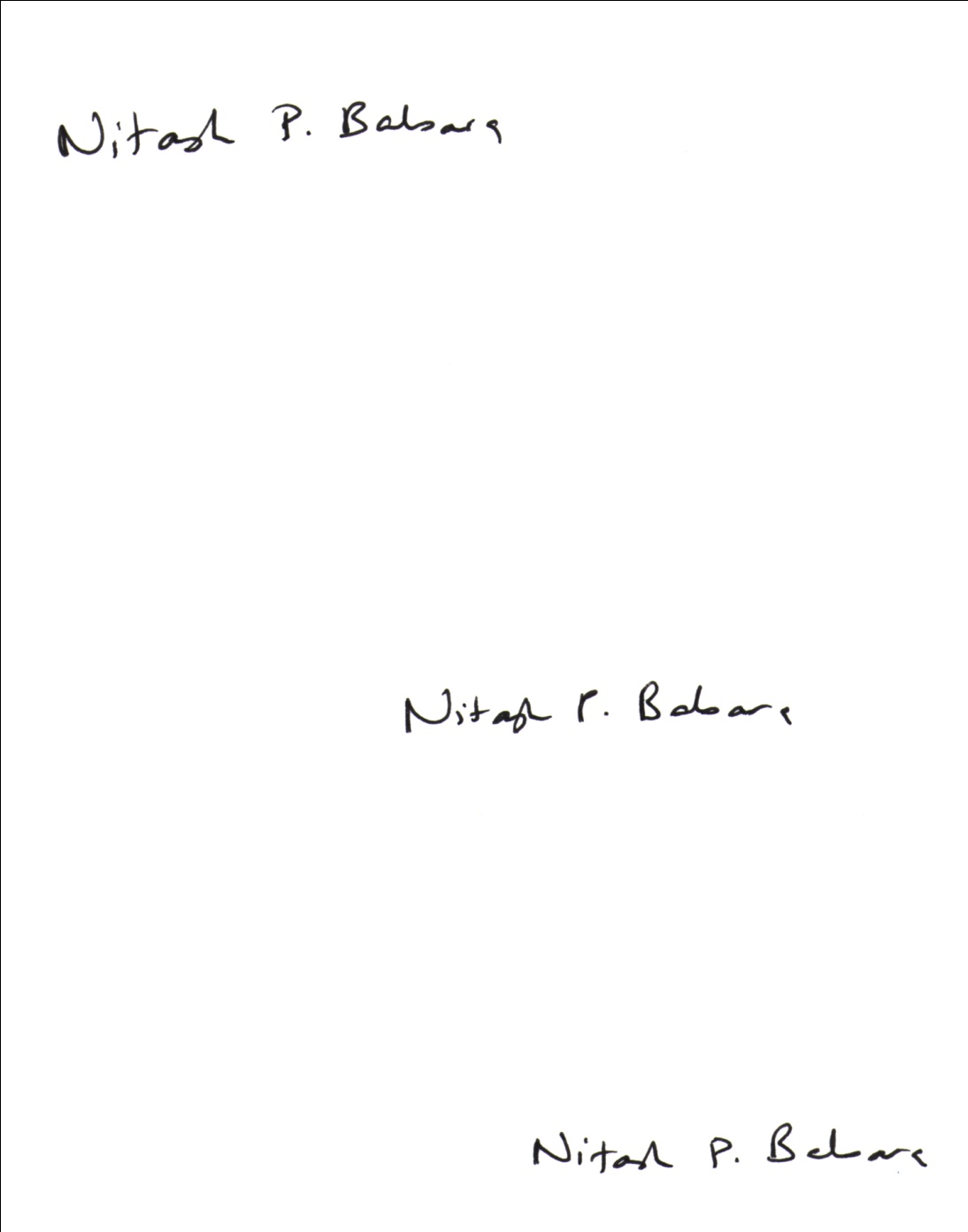
Please find our manuscript entitled "**Failure analysis of batteries using synchrotron-based hard X-ray microtomography**" by Katherine J. Harry, Dilworth Y. Parkinson, and Nitash P. Balsara enclosed.

Next-generation, rechargeable battery chemistries promise theoretical energy densities of over an order of magnitude larger than traditional lithium-ion batteries. However, these new chemistries require the use of a lithium metal anode in order to achieve these large improvements in energy density. Unfortunately, when the conventional graphite anode is replaced with a lithium metal anode the battery becomes prone to premature failure by short-circuit. This happens because lithium dendrites grow from the lithium metal anode as the battery is charged. Eventually the dendrites grow large enough to puncture the electrolyte and short the cell.

The procedure discussed in the enclosed manuscript describes a technique that allows researchers to easily visualize microstructural changes, like dendrite growth, that occur inside of a battery as it is cycled. While the procedure is specific to electrochemical cells with lithium metal electrodes and a solid polymer electrolyte, it can be extended to study a wide variety of battery chemistries and assemblies. Hard X-ray microtomography is a valuable diagnostic tool for monitoring micron-scale morphological changes in electrochemical systems and, hopefully, a video showing our procedure for preparing and imaging these samples will make it easier for other researchers to use this technique in their own studies.

In our study, the growth of lithium dendrites through high-modulus block copolymer electrolyte membranes is observed. The penetrating X-rays reveal structures within the electrode that are typically hidden when imaging with traditional electron or optical microscopy. These images have given us insight into the mechanism of lithium dendrite growth and enable us to propose rational approaches to slow or eliminate dendrite growth.

Yours sincerely,



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**Author contributions**

Katherine J. Harry: Composed manuscript and performed experiments.

Dilworth Y. Parkinson: Beamline scientist who aided in the experimental design.

Nitash P. Balsara: Principle investigator who helped with experimental design.

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