# Battery Diagnostics with Sensitive Magnetometry

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The ever-increasing demand for high-capacity rechargeable batteries highlights the need for sensitive and accurate diagnostic technology for determining the state of a cell, for identifying and localizing defects, or for sensing capacity loss mechanisms. Here, we demonstrate the use of atomic magnetometry to map the weak induced magnetic fields around a Li-ion battery cell as a function of state of charge and upon introducing mechanical defects. These measurements provide maps of the magnetic susceptibility of the cell, which follow trends characteristic for the battery materials under study upon discharge. In addition, the measurements reveal hitherto unknown long time-scale transient internal current effects, which were particularly pronounced in the overdischarged regime. The diagnostic power of this technique is promising for the assessment of cells in research, quality control, or during operation, and could help uncover details of charge storage and failure processes in cells.

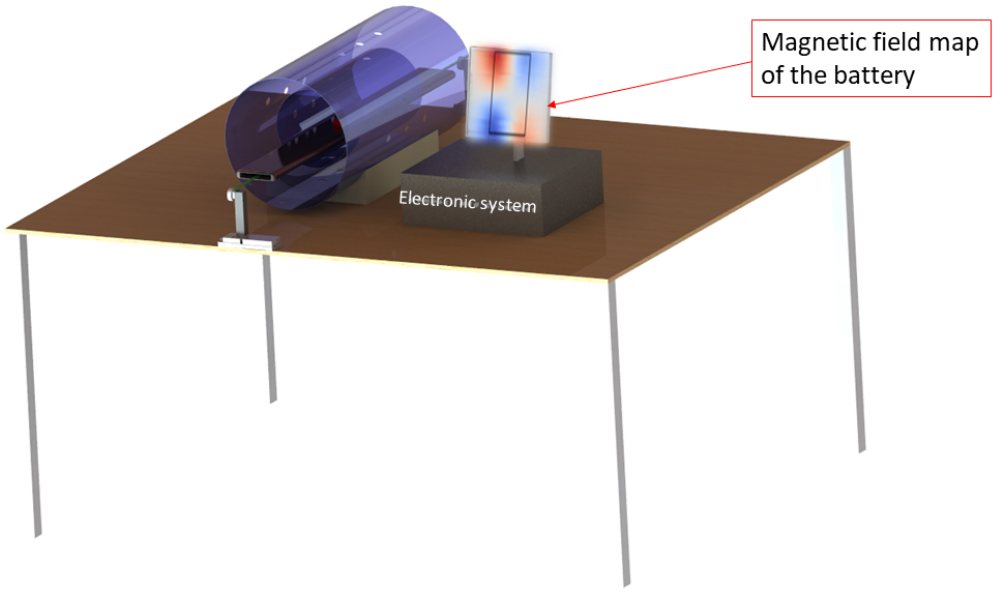


**Figure 1.** Schematic drawing of the experimental set up. Inset shows sample trace of battery's magnetic field map,