Magnetically tuneable piezoresistive sensor for direct, \textit{in situ} strain measurement in Li-ion batteries

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Supplementary Information

Ohmic response of the PRM sample

![I-V curve](image)

Linear fit: $y = 0.78 + 620x$

$R^2 = 0.99995$

Fig. S1 I-V curve of the c-PRM sample with 33 wt % Ni under zero strain. The PRM had been infiltrated with 1 M LiClO$_4$/EC + PC electrolyte prior to the experiment. Black dots are the data and the red line is the linear fit to the data.

Gauge Factor calculation

Gauge factor, $\Gamma$, was calculated using the equation\textsuperscript{1}:

$$\Gamma = -G(1 - 2\nu) - (1 + 2\nu)$$

Where $\nu$ is Poisson’s ratio ($\sim 0.35$ for polymer composites) and $G$ is the slope of the plots below.
Fig. S2 Logarithm of resistance versus the strain. The dotted lines are fitted linear lines used to calculate the G value.

X-ray diffraction of Sn before and after lithiation

Fig. S3 X-ray diffraction data of the 2-mm thick Sn foil (a) before and (b) after lithiation to 0.01 V. The Sn was lithiated at 0.5 mA/g Sn using Li counter electrode and 1 M LiClO$_4$/EC + PC electrolyte. Data comparison with JCPDS cards indicate that additional peaks in lithiated Sn can be attributed to multiple Li$_x$Sn$_y$ phases.

Reference