Supplementary Material for “Operando Magnetometry Reveals the Electrochemical Role of Transition Metals in Sn-Fe Alloy”

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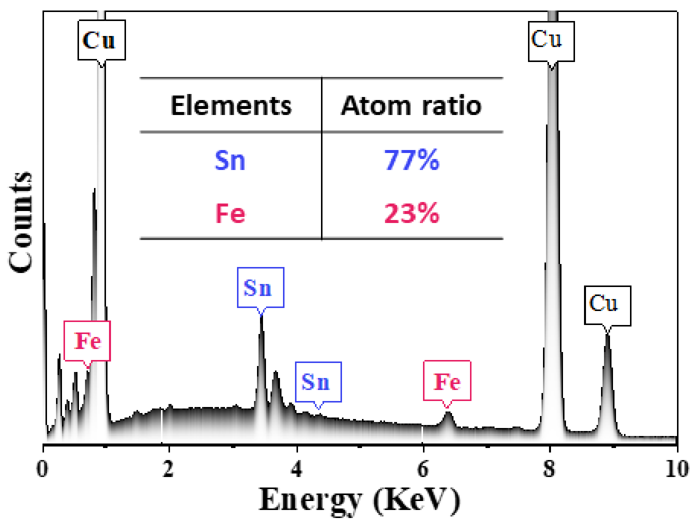

Fig. S1. EDX spectrum of the pristine sample, the Sn and Fe atomic ratios of 77% and 23%, respectively.

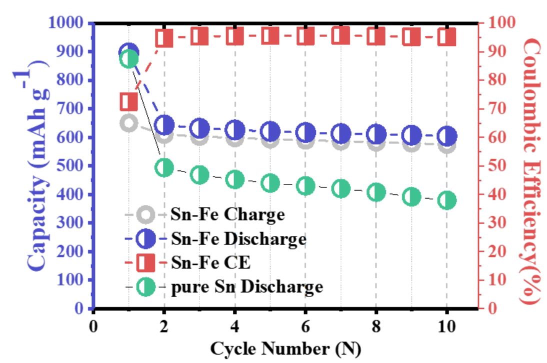

Fig. S2 Cycling performance and coulombic efficiency of Sn_3Fe and pure Sn electrode at 100 mA g^{-1}.

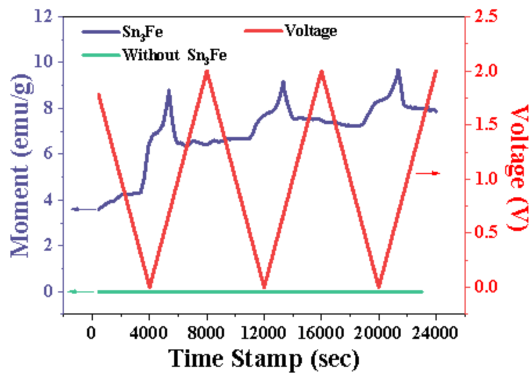

Fig. S3 Comparison of time-sequenced magnetic responses at an applied magnetic field of 3 tesla with respect to CV scans at a scan rate of 0.5 mV s^{-1}..

Information I

Supplementary fitting of superparamagnetic magnetization

The magnetization of superferromagnetic particles can be obtained by Langevin function: $M(H,T) = M_0 L(\mu_p H / kT)$, where M_0 is the saturation magnetization, $L(x) = \coth x - (1/x)$, μ_p is the magnetization of the individual particles. Considering the magnetic moments of each Fe atom are $2.2\,\mu_B$, it is obtained by fitting the experimental curves that the diameter of Fe particles is approximately 4.3 nm.

Supporting Information II

The relationship between the particle diameter d and T_B: $d = (150 k_B T_B / \pi K_{eff})^{1/3}$, where k_B is the Boltzmann constant 1.38×10^{-23} J K^{-1}, T_B is blocking temperature, and K_{eff} is the effective magnetic anisotropy constant. In terms of Fe nanoparticle, K_{eff} is assumed to 4.8×10^5 J m^{-3}. Thus, the approximations of average diameters are 4.4 nm and 6.5 nm corresponding to T_B values of 65 K and 200 K, respectively.