Electronic Supplementary Information

Magnetically controlled single-nanoparticle detection via particle-electrode collisions

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TEM and *in situ* EDX measurements

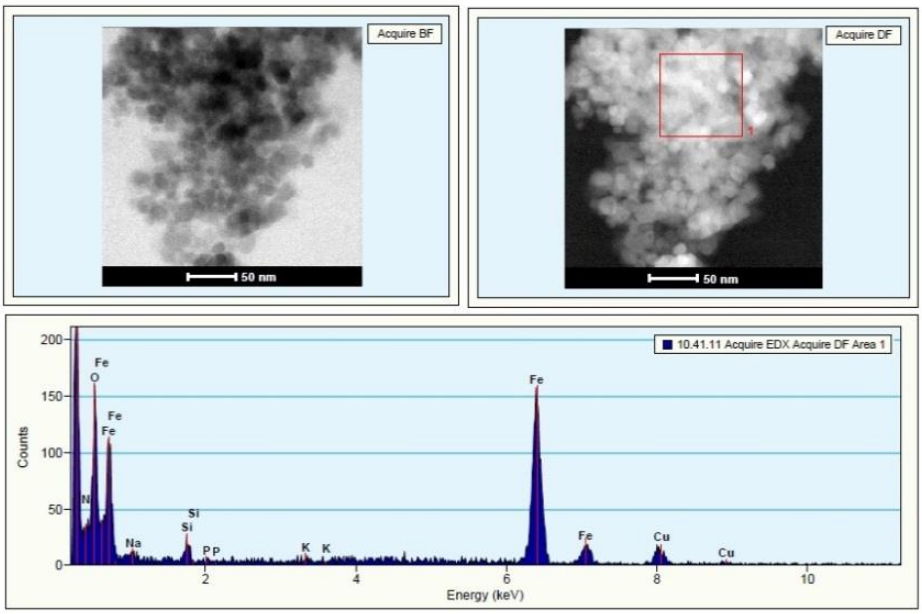

Figure S1. a) TEM images and EDX for NPs-Fe_3O_4-PB. In order to verify if all the NPs-Fe_3O_4 are coated, or just a fraction, we have isolated several PB modified-nanoparticles by TEM, and *in situ* EDX measurements were carried out for several of them (about 10 different regions on Cu grid). For that, we observed the same signal intensity corresponding to PB, which suggests homogeneous distribution of PB molecules onto NPs-Fe_3O_4. This latter is statistic evidence that the most of the particles are modified.

Baseline corrected current-time transient for spikes localization

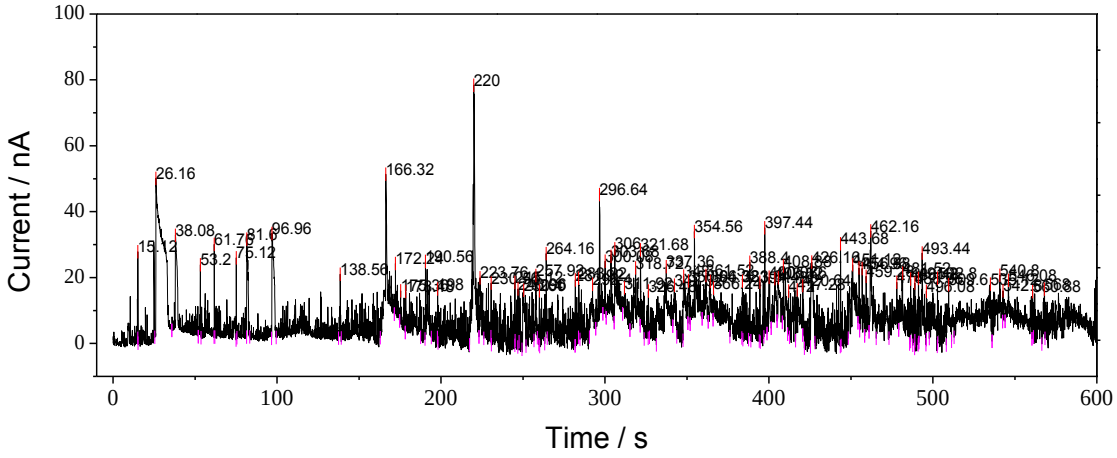

Figure S2. Baseline corrected current-time transient for spikes localization. High intensity spike were selected (76 peaks) ranging from 0 to 600 seconds. The baseline correction was used in order to subtract the total current originated from the NPs accumulations. Note that the number of spikes and they intensity decrease along the time. These informations were used to build up the plot in Fig.10b. In this work just the spike with current intensity 3xσ was considered, where 3xσ is the maximum current of the noise.