Electronic Supplementary Information

Cobalt/Polypyrrole Nanocomposites with Controllable Electromagnetic Properties

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Materials and Methods

Figure 6 is a contour map made by ORIGIN (V9.0). The sample thickness was set as the *X* axis, and the absorbing frequency was set as the *Y* axis. Each closed curve is a contour curve corresponding different reflection loss value. Thus, it could show the absorbing bandwidth (with RL< -10dB) at different thickness. The maximum height of each pattern just means the bandwidth at each thickness.

Supplementary Figures

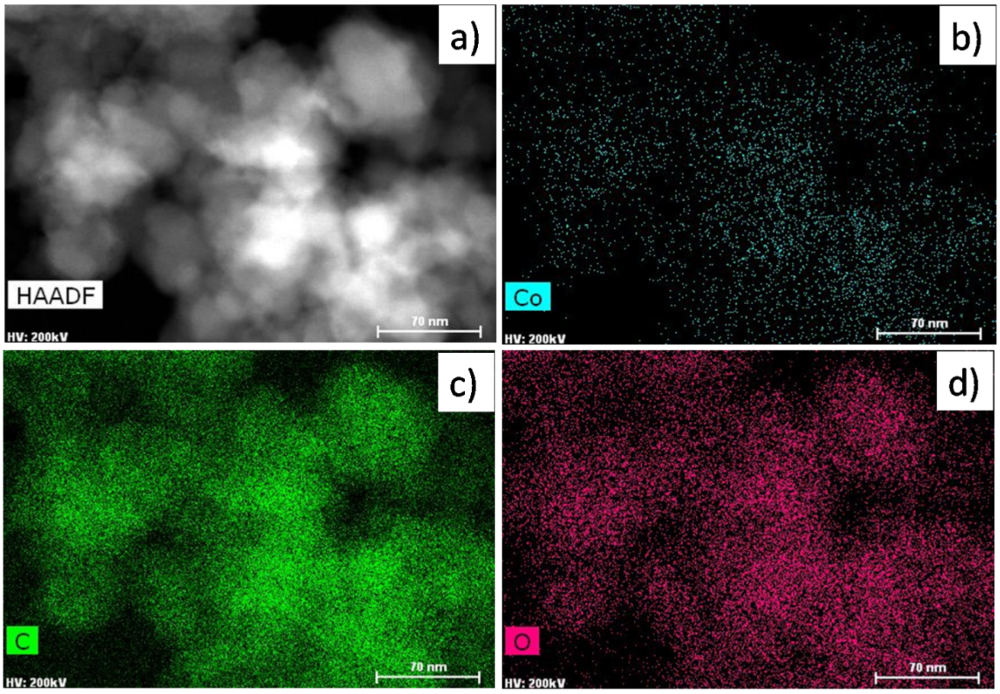

Figure S1 STEM-EDS element mapping of composites (a): cobalt (b), carbon (c), oxygen (d). These mapping images were taken from another place in the composites. It can be seen that, cobalt has a relatively even distribution in the Co/PPy naonocomposites.

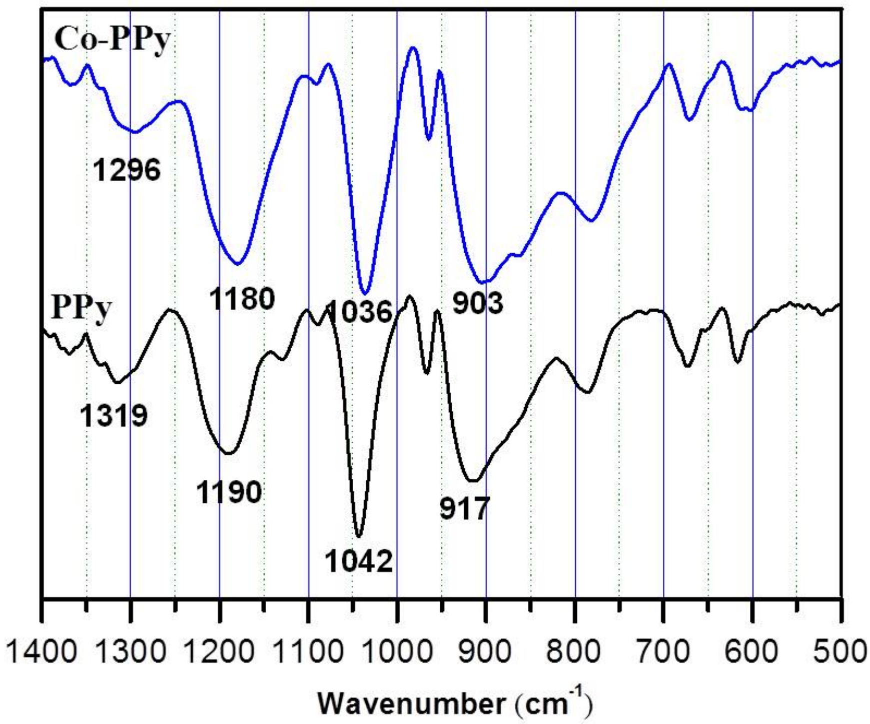

Figure S2 FT-IR spectra of PPy and Co/PPy composites. It can be seen that the absorption bands at about 1190 and 917 cm^{-1} (the stretching vibration of doped PPy), and bands at about 1042 cm^{-1} (the C-H deformation vibrations) and 1319 cm^{-1} (C-N stretching vibrations) shifted to smaller wavenumbers after the nanocomposition with Co nanoparticles. These shifts, especially the shift of C-N stretching vibrations (from 1319 to 1296 cm^{-1}) can prove the existence of the strong interaction between Co NPs and pyrolle moieties in PPy polymers.

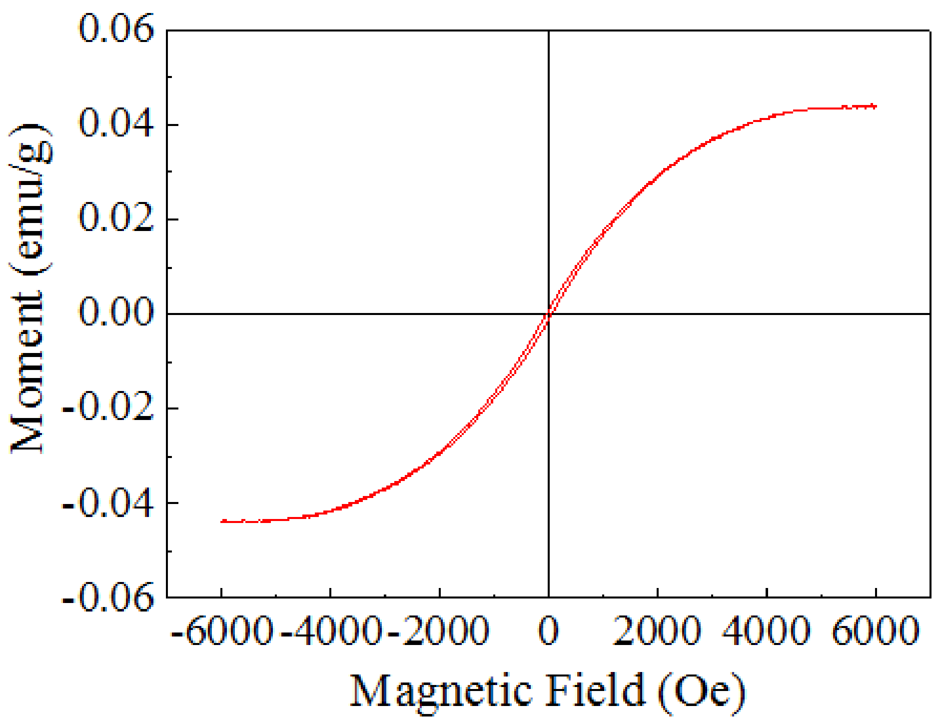

Figure S3 *M-H* loop of Co/PPy composites. The M_s value of the composite decreased comparing with that of cobalt particles. This can be easily understood that the cobalt particles are magnetic, while the PPy is nonmagnetic, and then the magnetic moment of Co/PPy composites was lower than that of pure cobalt particles since there is a very small fraction of cobalt particles in the composits.