Electronic Supplementary Material (ESI) for New Journal of Chemistry.

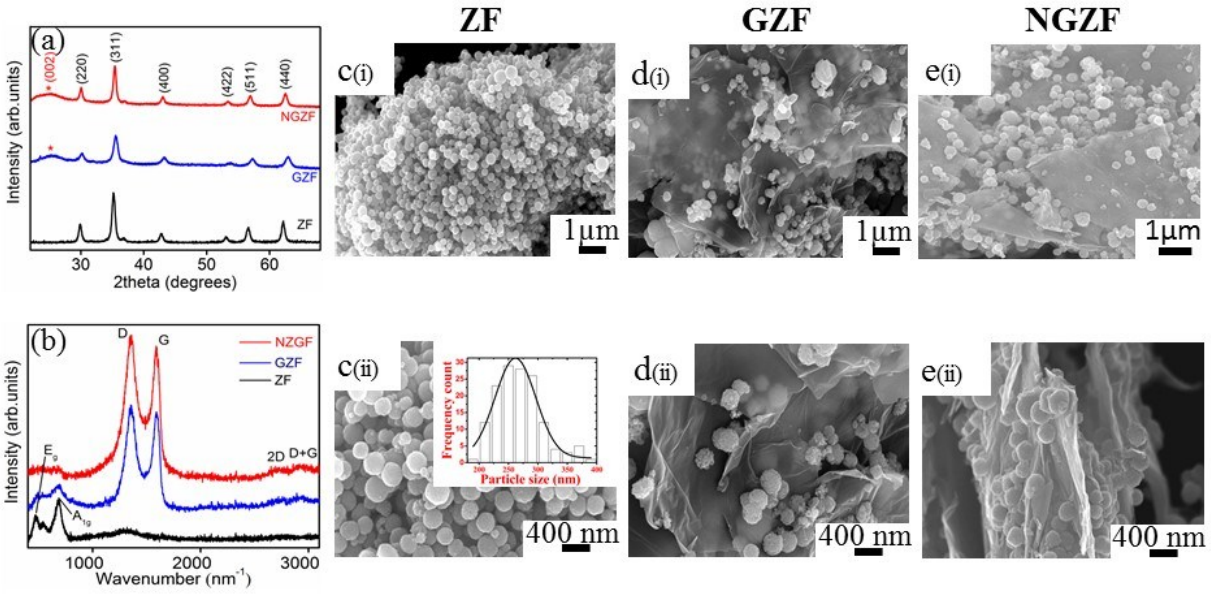

Fig. S1. Characterization of the anode NGZF. (a) X-ray diffraction patterns for $ZnFe_2O_4$ (ZF), graphene/$ZnFe_2O_4$ (GZF) and N-graphene/$ZnFe_2O_4$ (NGZF) showing dominant crystal phases of spinel ferrites which are consistent with JCPDS card no.897412 of. The (002) crystal phase of graphene seen after graphene incorporation. **(b)** Raman spectroscopic analysis of ZF, GZF and NGZF with Defective (D) band arising due to the defects induced on graphene sheet, Graphititc (G) band arising due to the sp^2 hybridized carbon atoms of graphene and 2D band from the second order scattering of two ITO phonons along with E_g and A_{1g} of ZF. FESEM images in different magnifications for c(i),c(ii) ZF, d(i),d(ii) GZF and e(i),e(ii) NGZF. The inset in Fig. c(ii) is a size distribution histogram of $ZnFe_2O_4$.

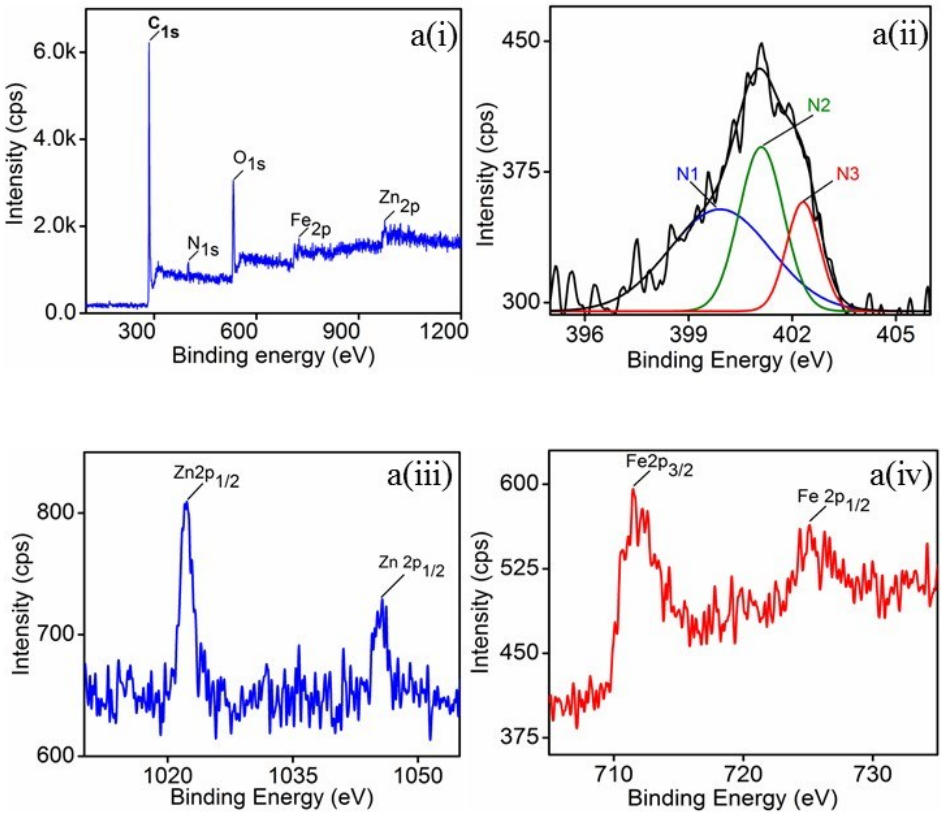

Fig. S2. Chemical composition nitrogen doped graphene composite with $ZnFe_2O_4$ (ZF) **(a(i))** Room temperature X-ray photoelectron spectroscopic survey spectrum spectra for nitrogen doped graphene composite with ZF nanoparticles **(a(ii))** N 1s spectrum with the pyridine peak at 399.1 eV (N1), graphitic peak at 401.04 eV (N2) and the oxygenated nitrogen peak at 402 eV (N3). **(a(iii))** Fe 2p spectrum with two different oxidation states at 711.57 and 725.10 eV. **(a(iv))** Zn 2p spectrum with the Zn $2p_{3/2}$ oxidation state at 1022.23 eV and Zn $2p_{1/2}$ state at 1046.23 eV.

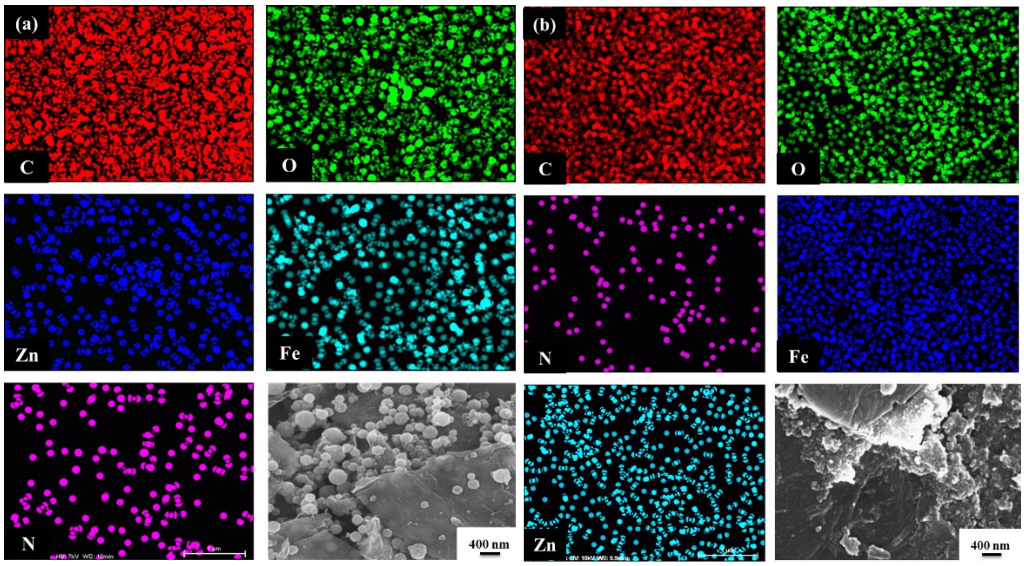

Fig. S3. Elemental mapping images of the composite N – doped graphene/ $ZnFe_2O_4$ (a) before charge discharge analysis, (b) After 100 cycles of charging and discharging. The elemental composition of the composite remains unchanged even after cycling, suggesting that N-doping influences the electronic and ionic conductivity neither conversion nor alloying with the Li-ion intercalating