BET

The pore structure and specific surface area of Zn$_{0.5}$Ni$_{0.5}$Fe$_2$O$_4$-S, N-GO were analyzed via nitrogen adsorption-desorption isotherms and pore size distributions (Fig. S1). By calculation, the specific surface area of Zn$_{0.5}$Ni$_{0.5}$Fe$_2$O$_4$-S, N-GO was 109.63 m$^2$·g$^{-1}$, and the pore diameter of it was mainly concentrated in 4.0 nm and 9.1 nm. The obtained results showed that Zn$_{0.5}$Ni$_{0.5}$Fe$_2$O$_4$-S, N-GO had a large specific surface area, and its surface pore structure was mainly mesoporous structure.

Fig. S1 N$_2$ adsorption-desorption isotherms spectrum of Zn$_{0.5}$Ni$_{0.5}$Fe$_2$O$_4$-S, N-GO.

VSM

VSM were performed to evaluate the magnetic property of the as-prepared nanocomposites at room temperature. The hysteresis loops of pure Zn$_{0.5}$Ni$_{0.5}$Fe$_2$O$_4$ and Zn$_{0.5}$Ni$_{0.5}$Fe$_2$O$_4$-S, N-GO nanocomposites were shown in Fig. S2. Both pure Zn$_{0.5}$Ni$_{0.5}$Fe$_2$O$_4$ and Zn$_{0.5}$Ni$_{0.5}$Fe$_2$O$_4$-S, N-GO were superparamagnetic because the magnetization of both two became almost zero when the magnetic field approaches zero[1]. The saturation magnetization of Zn$_{0.5}$Ni$_{0.5}$Fe$_2$O$_4$-S, N-GO was 55.42 emu·g$^{-1}$, which was lower than that of pure Zn$_{0.5}$Ni$_{0.5}$Fe$_2$O$_4$ (64.73 emu·g$^{-1}$), but its magnetic property was still suitable and sufficient for the needs of magnetic separation. Compared with pure Zn$_{0.5}$Ni$_{0.5}$Fe$_2$O$_4$, the magnetization values of Zn$_{0.5}$Ni$_{0.5}$Fe$_2$O$_4$-S, N-GO reduced by 9.31 emu·g$^{-1}$, which was mainly due to the existence of non-
magnetic S, N-GO.

Fig. S2 The magnetization curves of Zn$_{0.5}$Ni$_{0.5}$Fe$_2$O$_4$ (1) and Zn$_{0.5}$Ni$_{0.5}$Fe$_2$O$_4$-S, N-GO (2).

Fig. S3 The zeta potentials of DTC-Chm-GO.