

Synthesis, characterization and magnetic properties of MWCNTs decorated with Zn-substituted

$\text{Mn}_{1-x}\text{Zn}_x\text{Fe}_2\text{O}_4$ nanoparticles using waste battery extract

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Abstract $\text{Mn}_{1-x}\text{Zn}_x\text{Fe}_2\text{O}_4$ ($x = 0.2-0.8$) nano-crystals, synthesized from recycling of Zn-C batteries, were successfully self-assembled alongside multi-

walled carbon nanotubes (MWCNTs) via an environmentally friendly sucrose auto-combustion method. The effect of Zn-

content on structural and magnetic properties were

investigated and discussed. XRD revealed the formation of single-

phase ferrites. DTA-TG experiment showed that the auto-combustion reaction finished at about 350 °C.

TEM exhibited that the MWCNTs are well

decorated with ferrite particles. Hysteresis loop measurements revealed ferromagnetic behavior, with

saturation magnetization decrease by the addition of MWCNTs or increasing Zn-Content. The kinetics

of methylene blue dye (MB) removal using MWCNTs/ $\text{Mn}_{0.8}\text{Zn}_{0.2}\text{Fe}_2\text{O}_4$

nano-composite was investigated and discussed. &

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