Supporting information

Sodium modified reduced graphene oxide-Fe_3O_4 nanocomposite for efficient lead (II) adsorption

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1. Thermo gravimetric analysis (TGA):

To know the amount of Fe_3O_4 loading present on the as-synthesized Sodium modified Graphene - iron oxide nanocomposite (SMGI), TGA of reduced graphene oxide (rGO) and SMGI samples were carried out in air atmosphere. Weight loss occurred around 250 °C in rGO (from a derivative thermogravimetric curve) is due to the decomposition and vaporization of various functional groups at different positions on GO. The large weight loss from 430 °C can be attributed to conversion of Carbon into Carbon dioxide and the weight loss at 520 °C could be phase transition of Fe_3O_4 into FeO [1]. RGO started oxidizing from 400°C and completely got oxidized into Carbon dioxide at 630°C leaving iron oxide. TGA curves shows that Fe_3O_4 loading on rGO in SMGI is 29.3% weight.

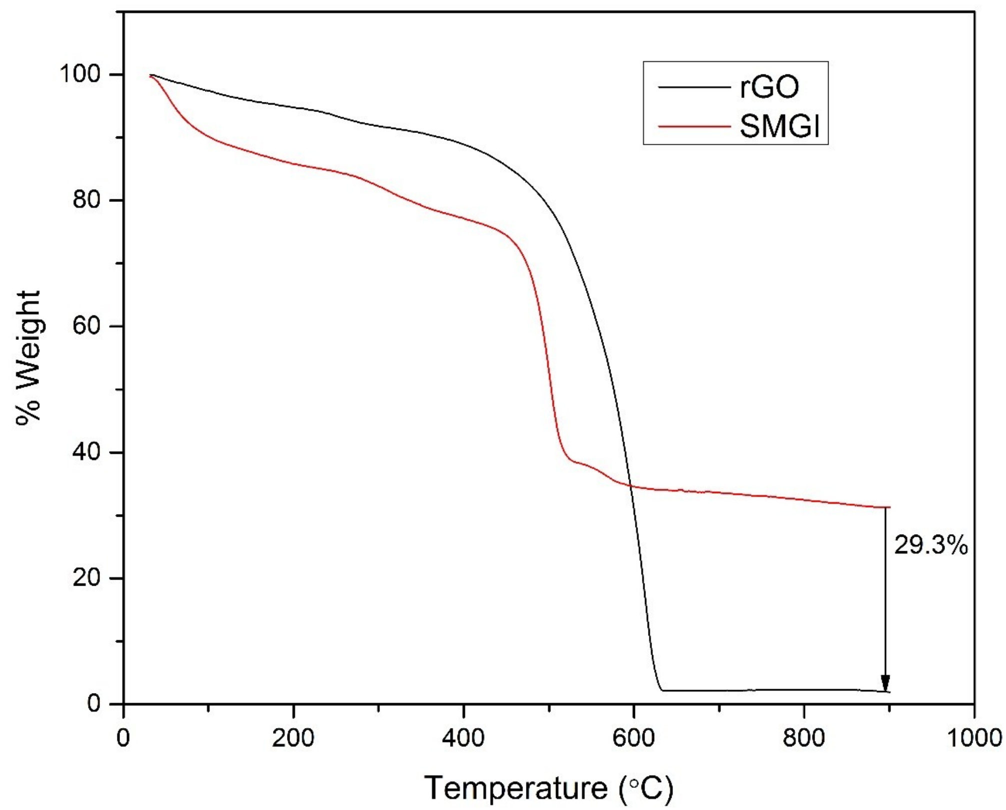

Figure S1. TGA curves of Graphene and SMGI nanocomposite

2. X-ray diffraction (XRD):

XRD pattern of Fe_3O_4 in Fig.S2 confirms that Iron oxide nanoparticles were successfully synthesized by co-precipitation method. XRD peaks of the as-synthesized Iron oxide nanoparticle sample matches with ICDD card no: 79-0417 confirming that Iron oxide nanoparticle are formed in magnetite phase and cubic structure.

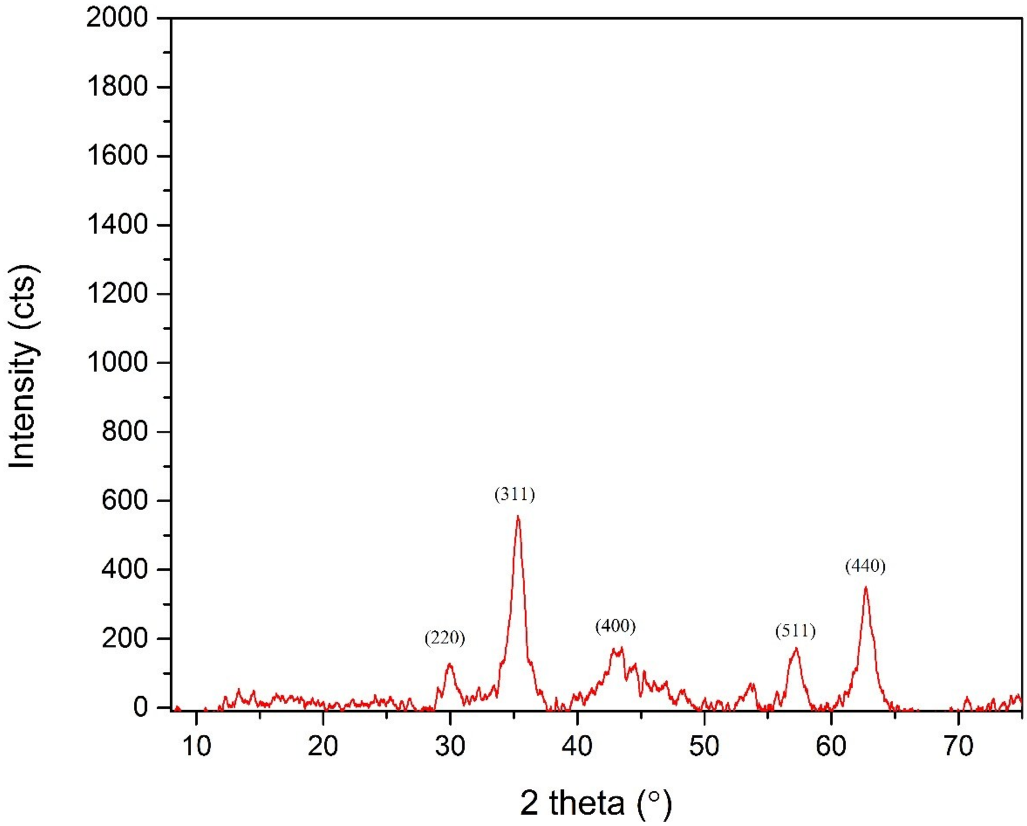

Figure S2. XRD pattern of as-synthesized Fe_3O_4 nanoparticles

3. Transmission electron microscopy (TEM):

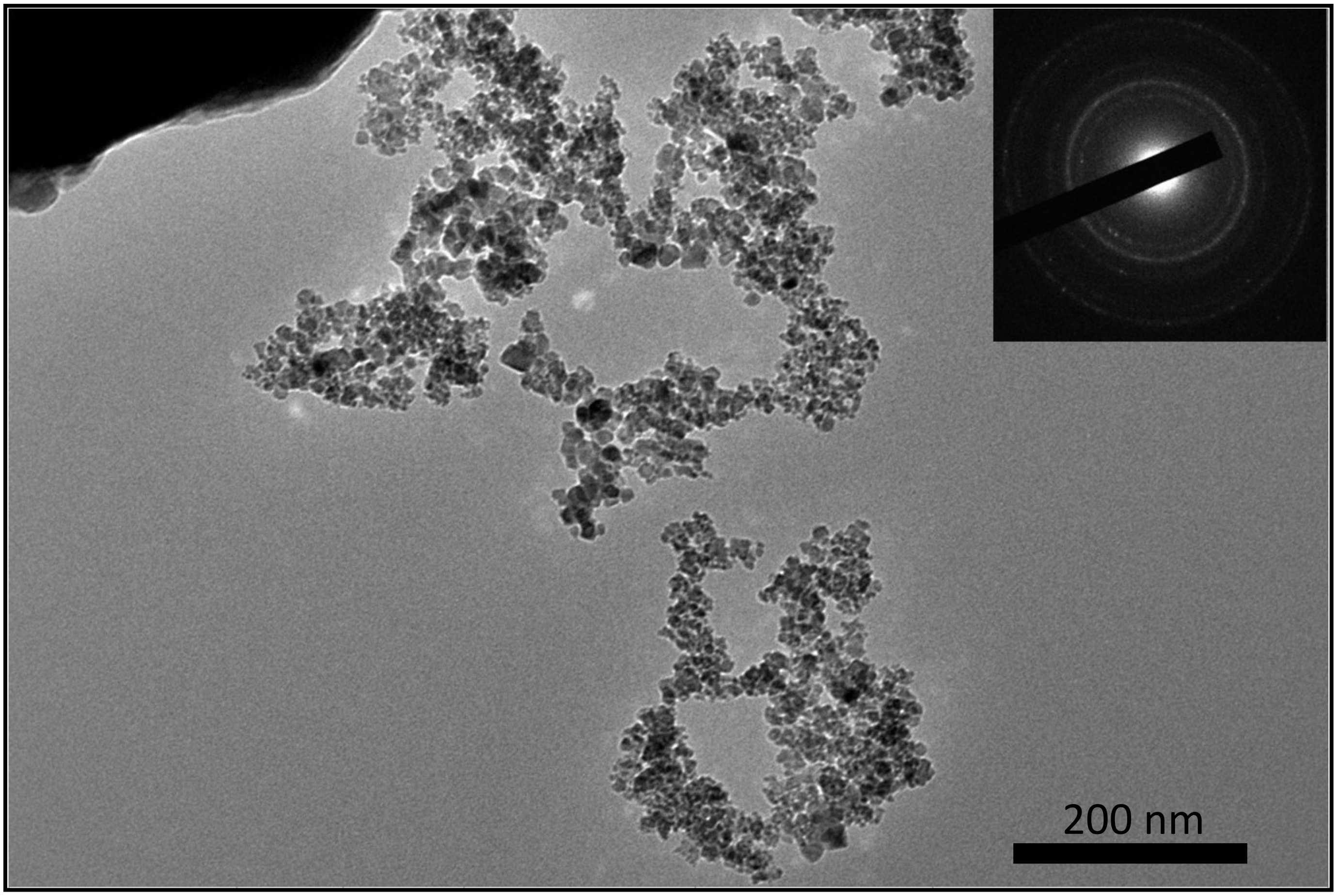

Figure S3. TEM image of Fe_3O_4 nanoparticles (inset-SAED Pattern)

4. Vibrating sample magnetometer analysis (VSM):

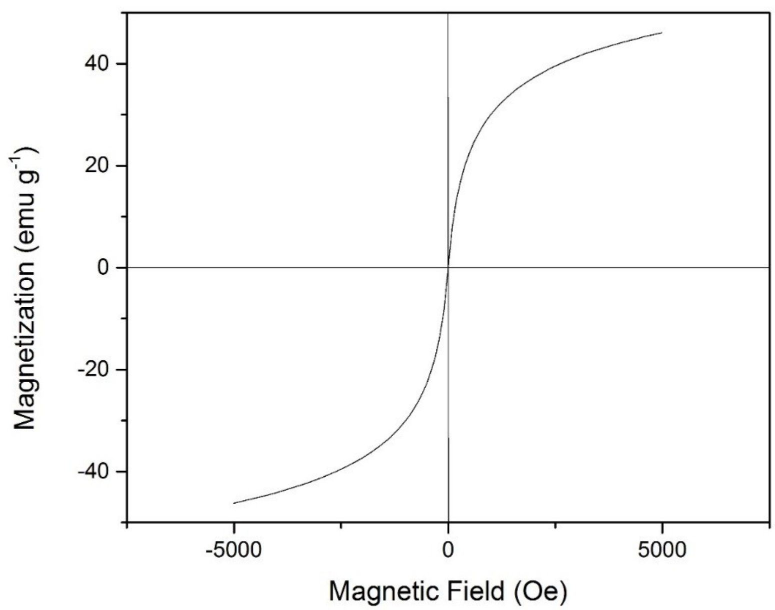

Figure S4. Magnetization curve of Fe_3O_4 nanoparticles

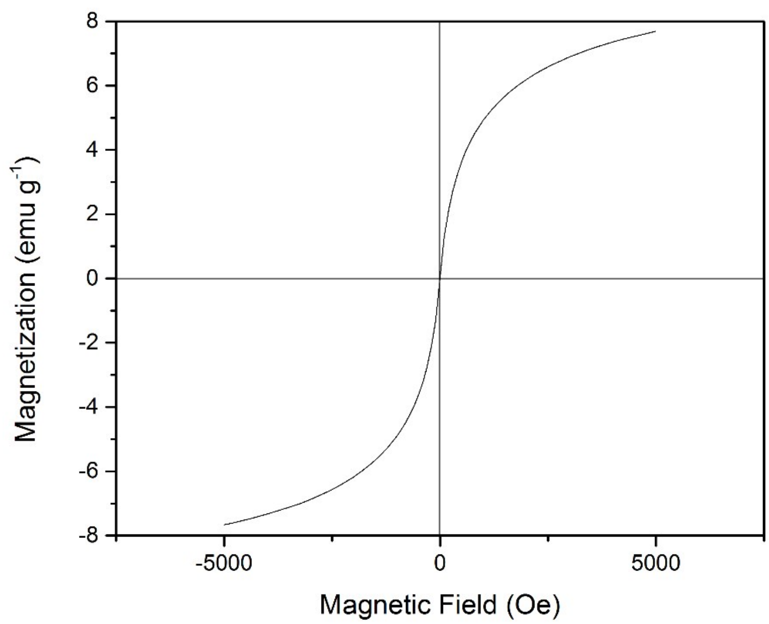

Figure S5. Magnetization curve of SMGI nanocomposite

The saturation magnetization of SMGI nanocomposite is found to be 7.72 emu compared to 46.14 emu of as synthesized Fe_3O_4 nanoparticles which can be due to its 29.3% loading on to the composite (Fig. S4, S5). Though the saturation magnetization is small for the composite, it was strong enough for effective magnetic separation.

5. Ion exchange Confirmation

Increase in sodium ion concentration in water has been observed with simultaneous decrease in Pb, which confirms that Pb is getting adsorbed at the sodium sites as shown in Figure S6.

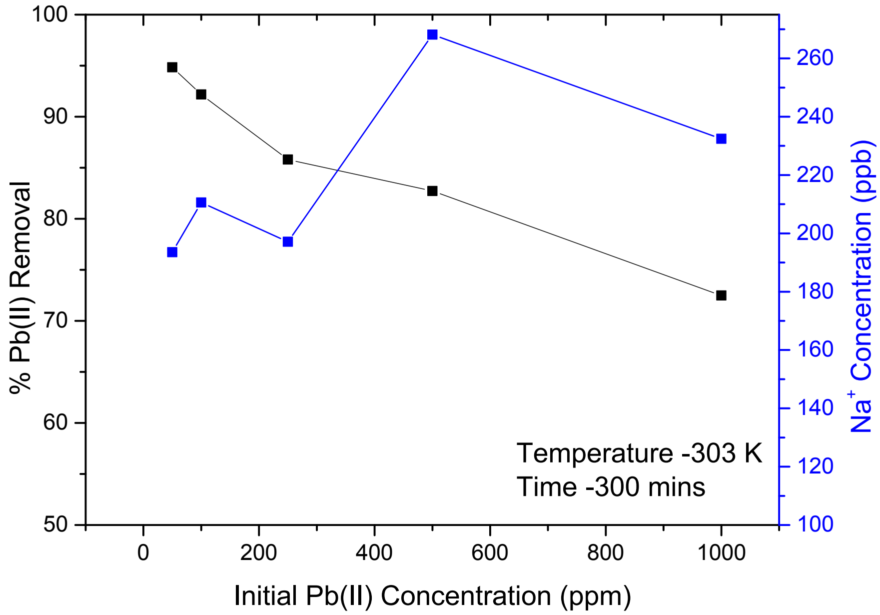

Figure S6: Variation of Pb and Na ion in water with adsorption

References:

[1] S.F. Chin, K.S. Iyer, C.L. Raston, Fabrication of carbon nano-tubes decorated with ultra fine superparamagnetic nano-particles under continuous flow conditions, Lab on a Chip, 8 (2008) 439-442.