Electronic Supplementary Material (ESI) for Analytical Methods.

Electronic Supplementary Material

Ultrasensitive fluorometric determination of aluminum using $CoFe_2O_4$ NPs/SDS/oxine system with the aid of ultrasound waves

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Instrumentation

The morphology assessment of $CoFe_2O_4$ NPs and oxine/SDS@$CoFe_2O_4$ NPs was conducted through transmission electron microscopy (TEM) using the JEOL JSM-7600 F instrument. Scanning electron microscopy (SEM) was employed, utilizing the JEOL JSM-5400 LV instrument in Oxford, USA. Elemental micro-analysis was carried out using the EDX technique with the OXFORD Aztec instrument in the USA. The spectrofluorometer RF-5301 PC from Shimadzu, Tokyo, Japan, was employed for the study, with the excitation and emission slit control configured at a slit width of 5 nm, utilizing a 1 cm quartz cell. Fourier-transform infrared (FT-IR) spectra in the range of 400–4000 cm^{-1} were recorded using the Nicolet™ iS™10 spectrometer. X-ray diffractometry (XRD) measurements were conducted using a Philips/1710, USA. Particle size distribution was determined through dynamic light scattering (DLS) techniques using the Zeta-sizer Nano ZS instrument from Malvern in the UK. Magnetic properties of the samples were carried out using Lakeshore vibrational sample magnetometer (VSM-7410). The N_2 sorption experiment was carried out by Micromeritics ASAP 2020 analyzer. The sample was out gassed at 150°C for 12 h in a dynamic vacuum before physisorption measurements. The specific surface area was calculated using Brunauer-Emmet-Teller (BET) method.

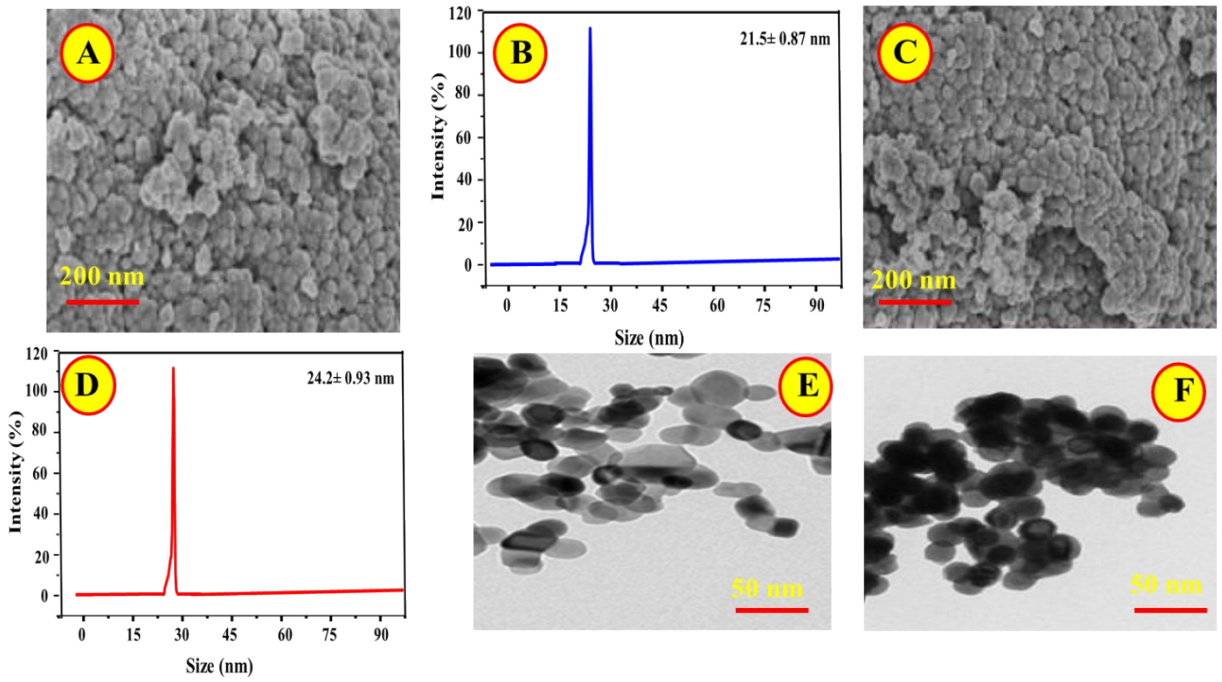

Fig.S1 SEM image (A) and DLS (B) of $CoFe_2O_4$ NPs while (C) and (D) are SEM image and DLS of oxine/SDS@$CoFe_2O_4$ NPs, respectively. TEM images of $CoFe_2O_4$ NPs and oxine/SDS@$CoFe_2O_4$ NPs are presented in (E) and (F), respectively.

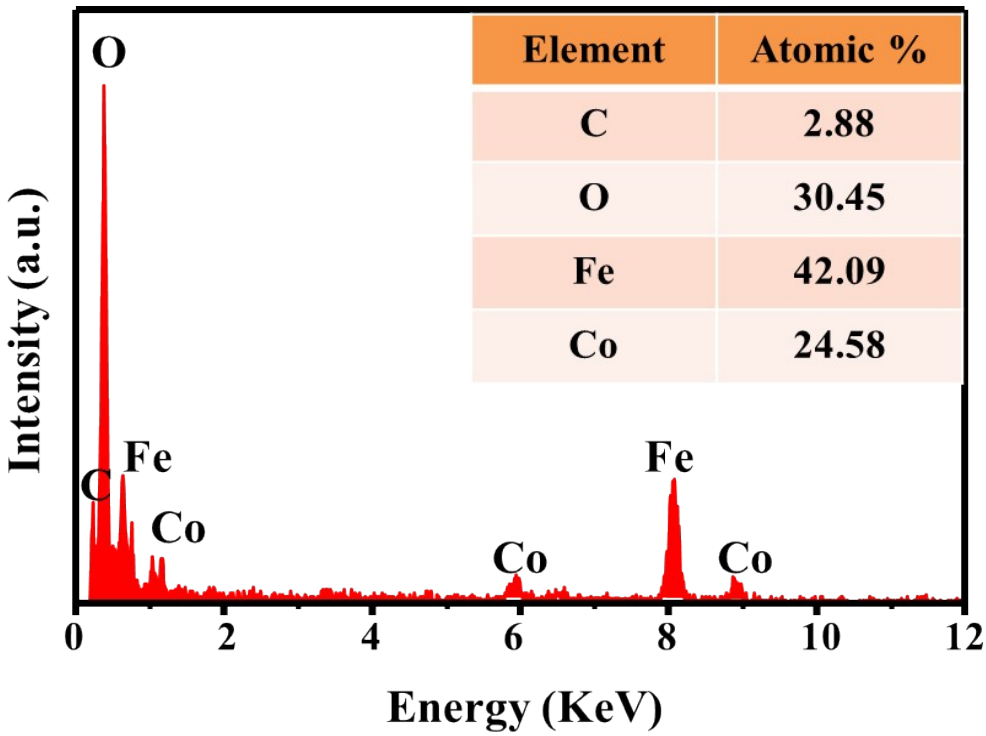

Fig.S2 EDX pattern of oxine/SDS@$CoFe_2O_4$ NPs.

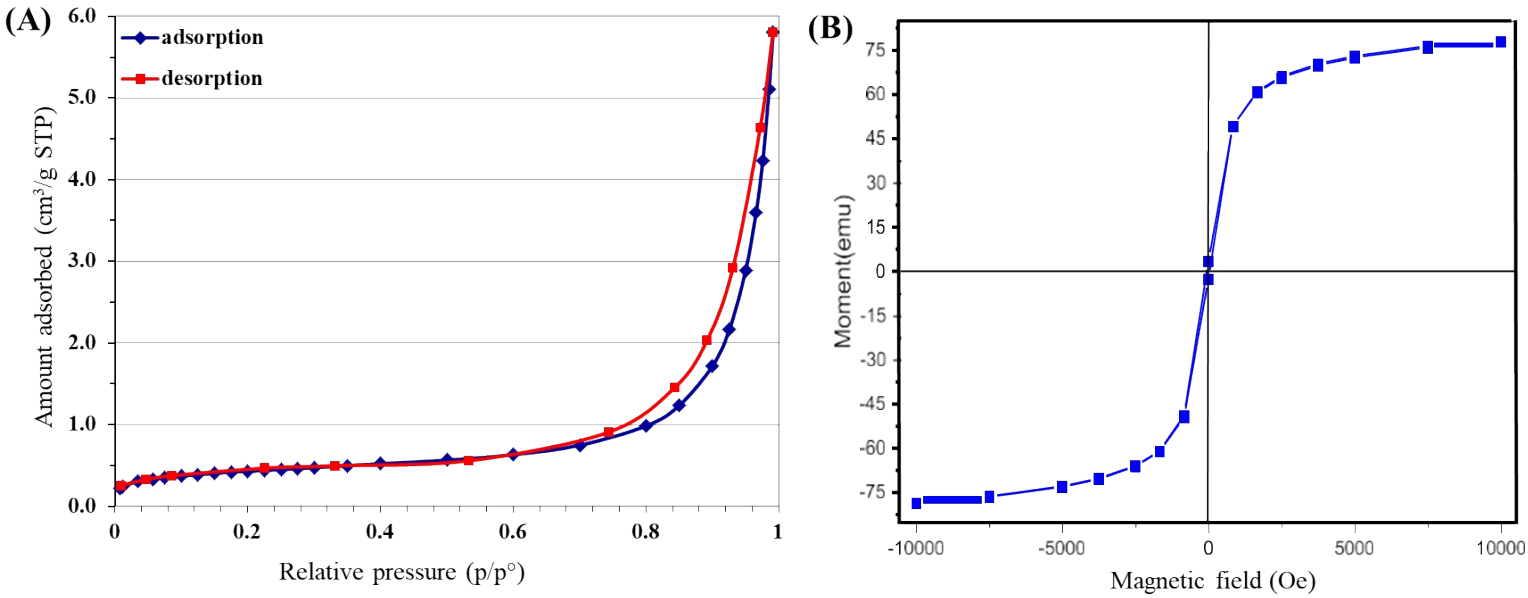

Fig.S3 BET analysis (A) and vibrating sample magnetometer (B) for oxine/SDS@$CoFe_2O_4$ NPs.

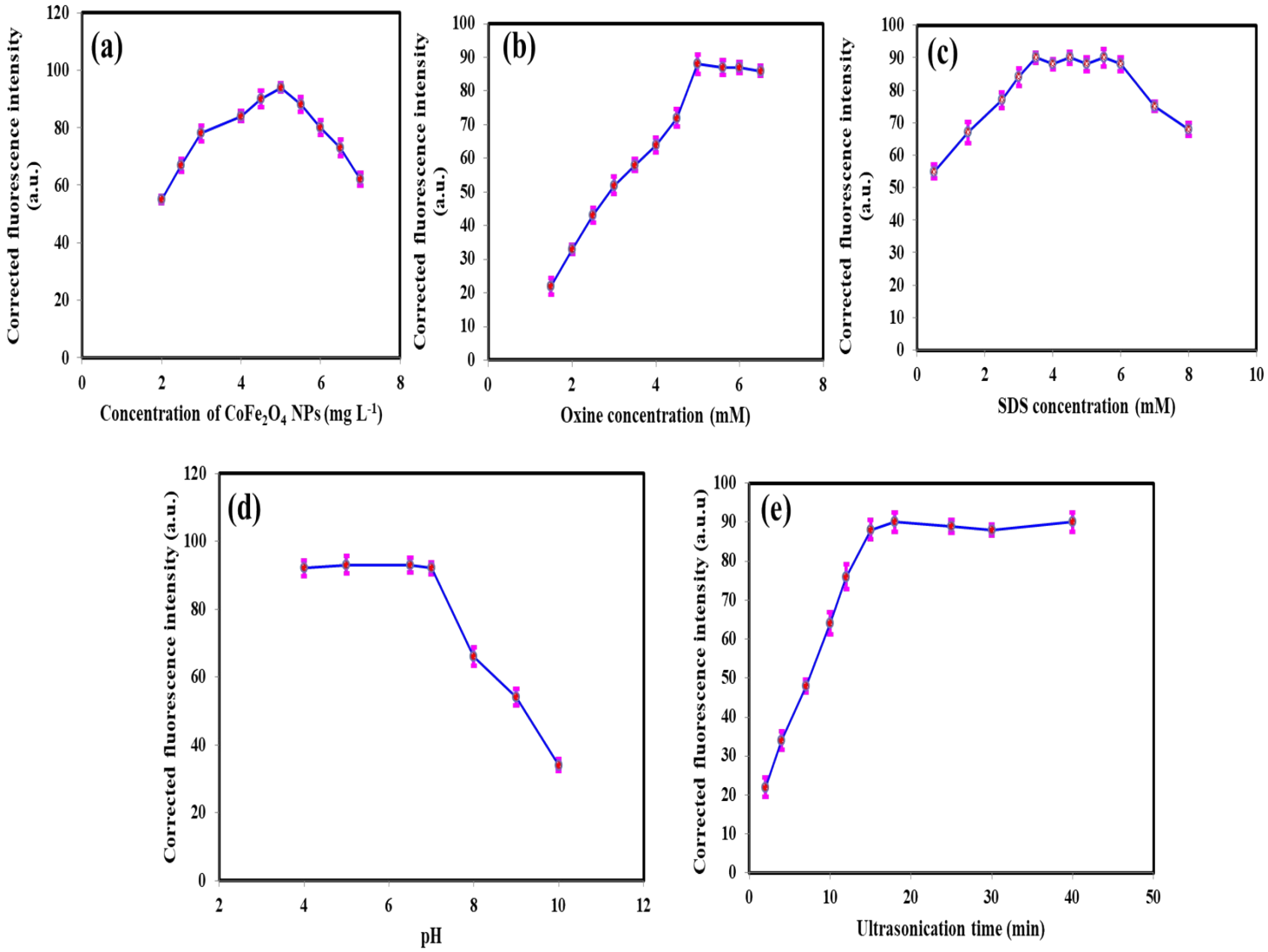

Fig.S4 The effect of $CoFe_2O_4$ NPs concentration (a), oxine concentration (b), SDS concentration (c), pH (d), and ultrasonication time (e) during the preparation of oxine/SDS@$CoFe_2O_4$ NPs. Concentration of Al^{3+} is 70 ng mL^{-1}.

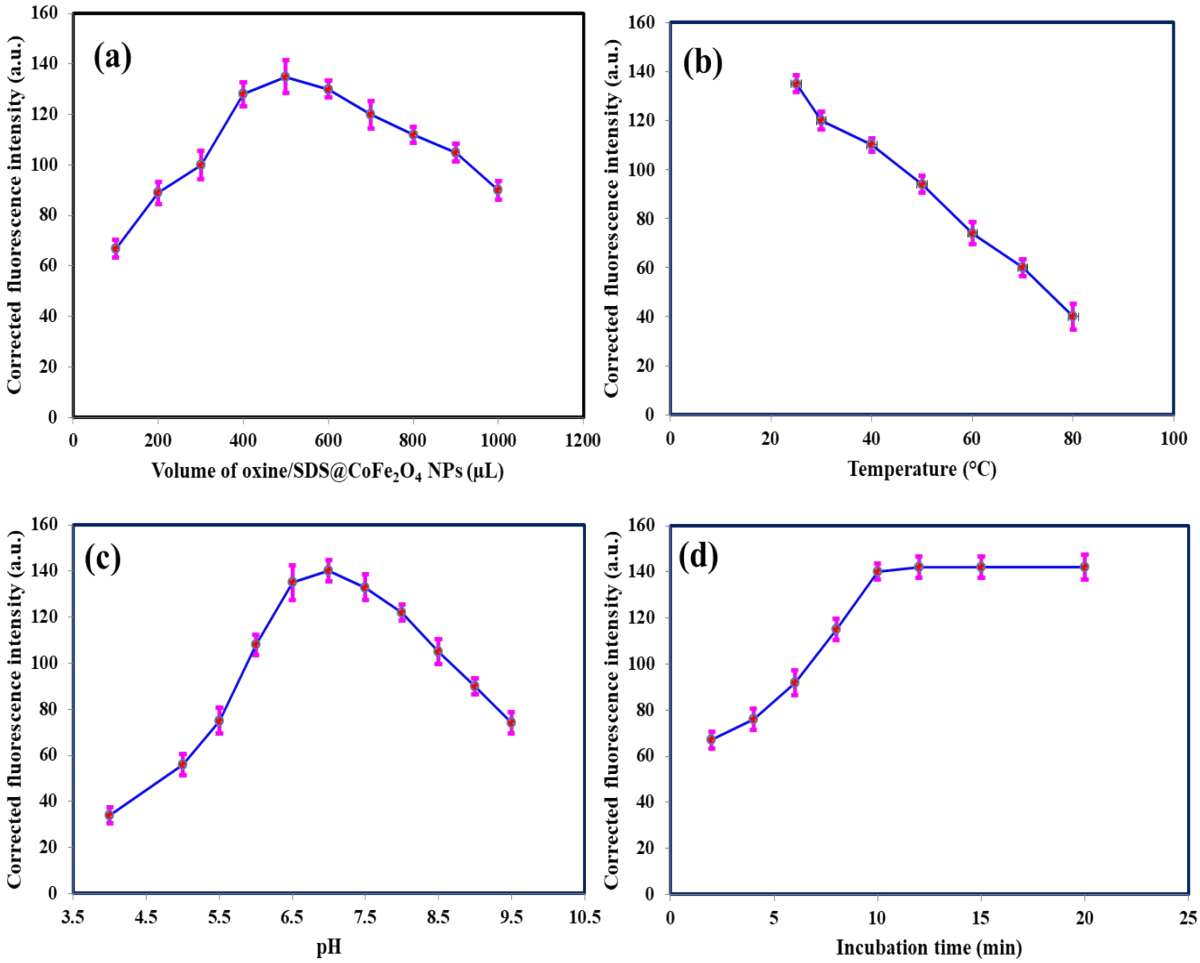

Fig.S5 The effect of oxine/SDS/$CoFe_2O_4$ NPs volume (a), temperature (b), pH (c), and incubation time (d). Concentration of Al^{3+} is 100 ng mL^{-1}.

Table S1 Tolerance ratios of interfering species in determination of 100 ng mL^{-1} Al^{3+}.

Interfering species	Tolerance ratio	
	Before masking	After masking
Ascorbic acid, dopamine, methionine	5000	5000
Adenine, guanine, cysteine	2200	2200
Na^{+}, K^{+}, Cl^{-}, SO_4^{2-},CH_3COO^{-}, Ba^{2+}	1800	1800
Oxalic acid, citric acid,	1600	1600
Pb^{2+}, EDTA, Mg^{2+}	700	700
Zn^{2+}	100	1200
Fe^{2+}, Fe^{3+}	100	1200
Cr^{3+}	50	1000
MnO_4^{-}, Cu^{2+}, Cd^{2+}	400	400
F^{-}	15	500