

Fast and highly efficient purification of 6×histidine-tagged recombinant proteins by Ni-decorated $\text{MnFe}_2\text{O}_4@\text{SiO}_2@\text{NH}_2@2\text{AB}$ as a novel and efficient affinity adsorbent magnetic nanoparticles

Zahra Rashid,¹ Hossein Naeimi,¹ Amir-Hassan Zarnani,^{2,3} Mahboobeh Nazari,⁴ Mohammad-Reza Nejadmoghaddam,^{4,5} and Ramin Ghahremanzadeh^{*4}

¹Department of Organic Chemistry, Faculty of Chemistry, University of Kashan, Kashan, 87317, I.R. Iran.

²Reproductive Immunology Research Center, Avicenna Research Institute, ACECR, Tehran, Iran.

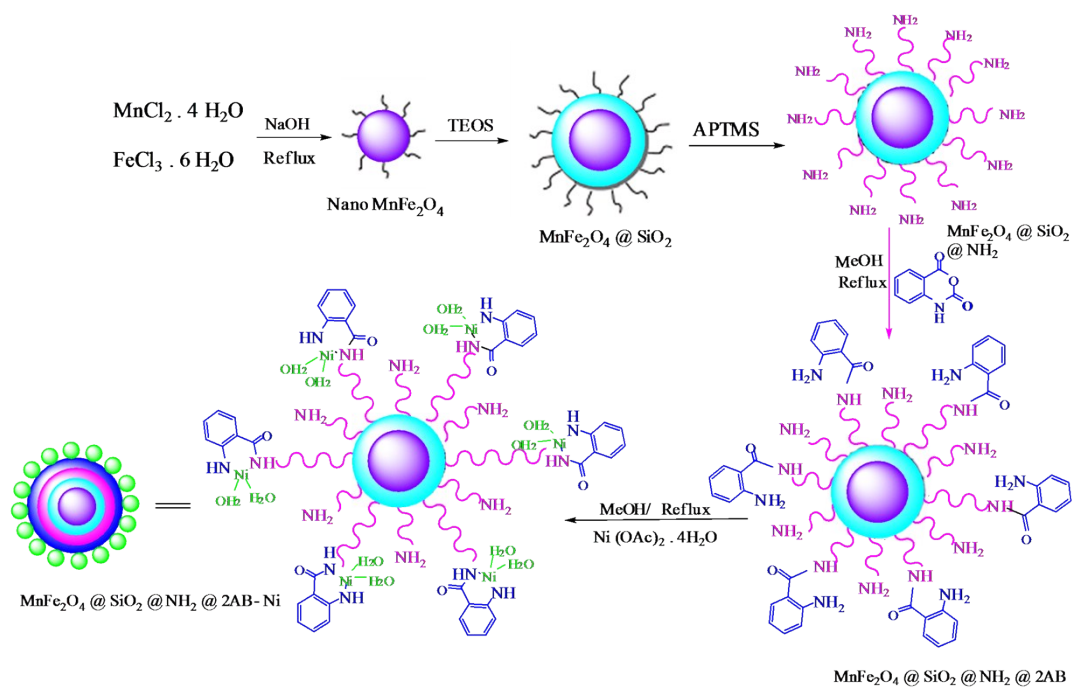
³Immunology Research Center, Iran University of Medical Sciences, Tehran, Iran.

⁴Nanobiotechnology Research Center, Avicenna Research Institute, ACECR, Tehran, Iran.

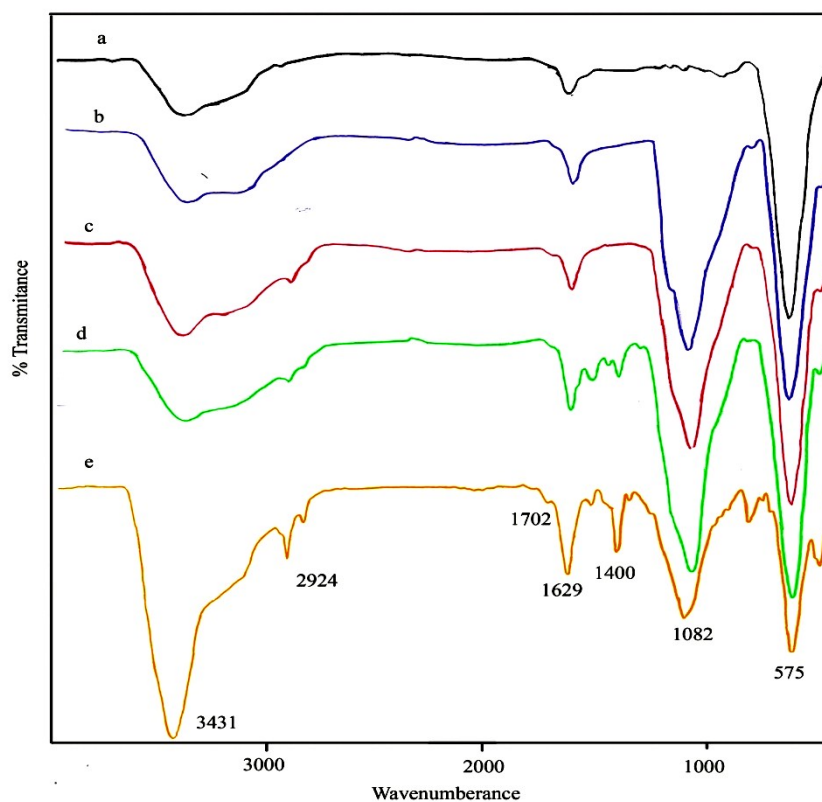
⁵Nanobiotechnology Research Center, Faculty of Pharmacy, Tehran University of Medical Science (TUMS), Tehran, Iran.

SUPPORTING INFORMATION

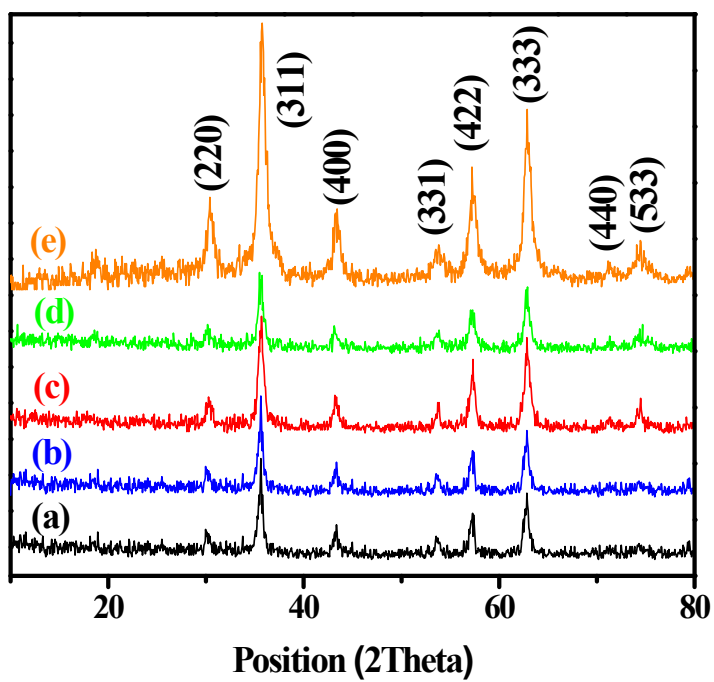
<i>List of contents</i>	<i>Page</i>	<i>List of contents</i>	<i>Page</i>
Title, author's name, address	1	S6. TGA curves of magnetic nanoparticles	6
S1. Steps for fabricating of $\text{MnFe}_2\text{O}_4@\text{SiO}_2@\text{NH}_2@2\text{AB-Ni}$	2	S7. EDX spectrum of $\text{MnFe}_2\text{O}_4@\text{SiO}_2@\text{NH}_2@2\text{AB-Ni}$	6
S2. FT-IR spectra of magnetic nanoparticles	3	S8. SDS-PAGE analysis	7
S3. XRD patterns of magnetic nanoparticles	4		
S4. The SEM image of magnetic nanoparticles	5		
S5. Magnetization curves of magnetic nanoparticles	5		



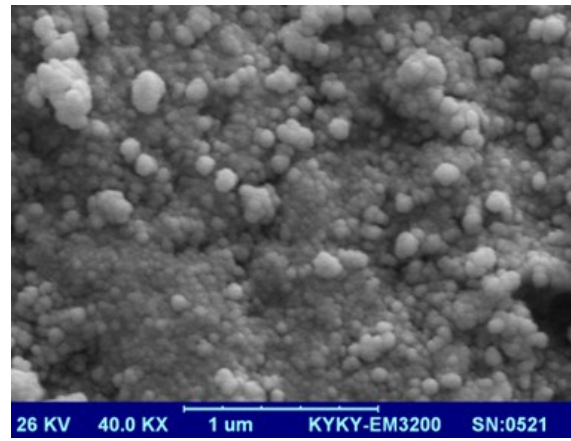
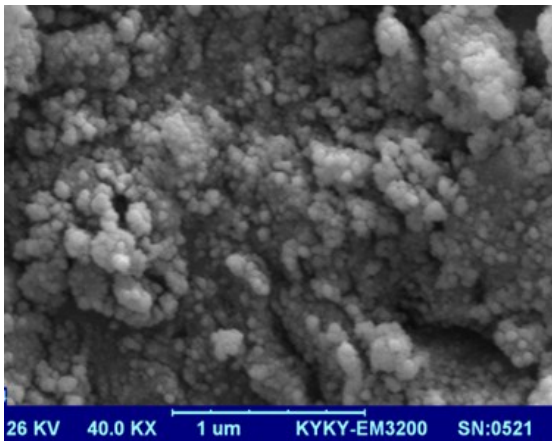
S1. Steps for fabricating of $\text{MnFe}_2\text{O}_4 @ \text{SiO}_2 @ \text{NH}_2 @ 2\text{AB-Ni}$



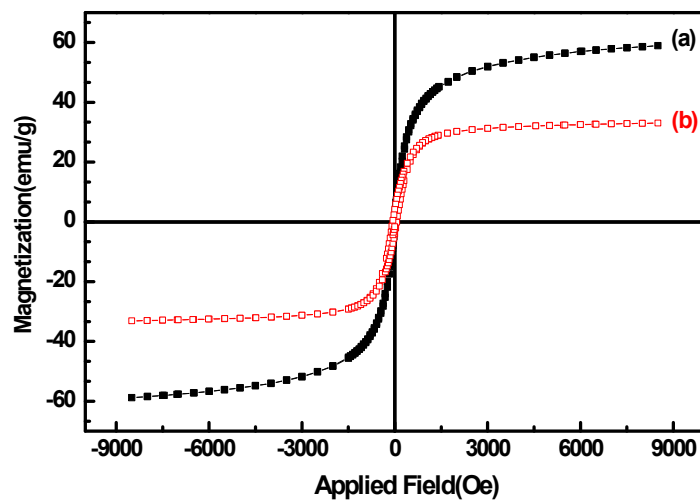
S2. The comparative FT-IR spectra for (a) MnFe_2O_4 , (b) $\text{MnFe}_2\text{O}_4@\text{SiO}_2$, (c) $\text{MnFe}_2\text{O}_4@\text{SiO}_2@\text{NH}_2$, (d) $\text{MnFe}_2\text{O}_4@\text{SiO}_2@\text{NH}_2@2\text{AB}$, and (e) $\text{MnFe}_2\text{O}_4@\text{SiO}_2@\text{NH}_2@2\text{AB}-\text{Ni}$.



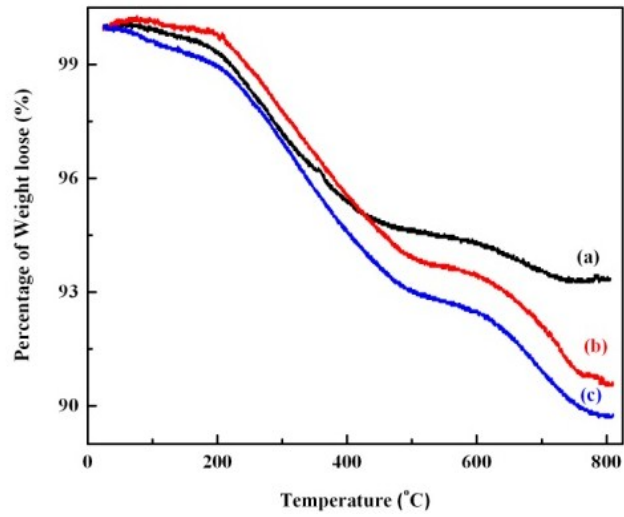
S3. XRD patterns of (a) MnFe_2O_4 , (b) $\text{MnFe}_2\text{O}_4@\text{SiO}_2$, (c) $\text{MnFe}_2\text{O}_4@\text{SiO}_2@\text{NH}_2$, (d) $\text{MnFe}_2\text{O}_4@\text{SiO}_2@\text{NH}_2@2\text{AB}$, and (e) $\text{MnFe}_2\text{O}_4@\text{SiO}_2@\text{NH}_2@2\text{AB-Ni}$.



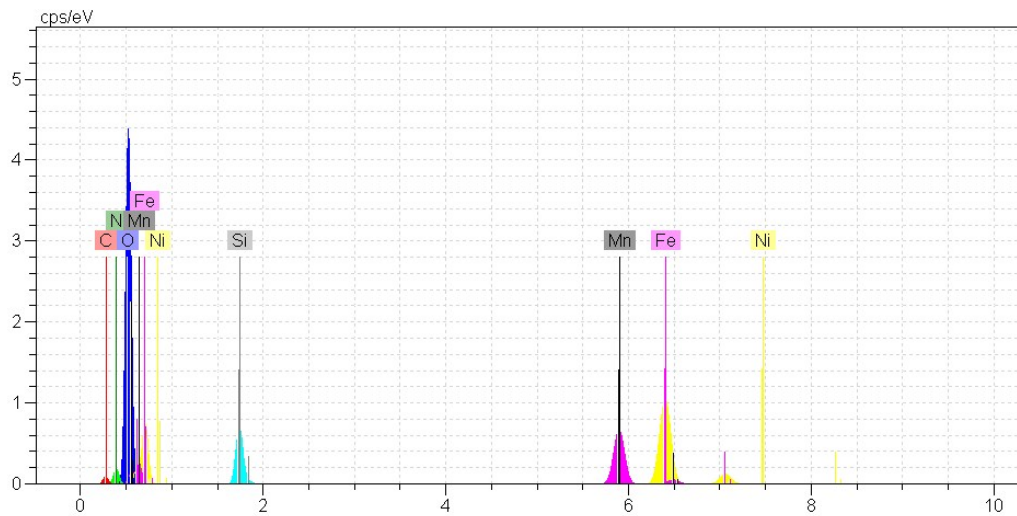
S4. The SEM image of (a) MnFe_2O_4 and (b) $\text{MnFe}_2\text{O}_4@\text{SiO}_2@\text{NH}_2@2\text{AB-Ni}$.



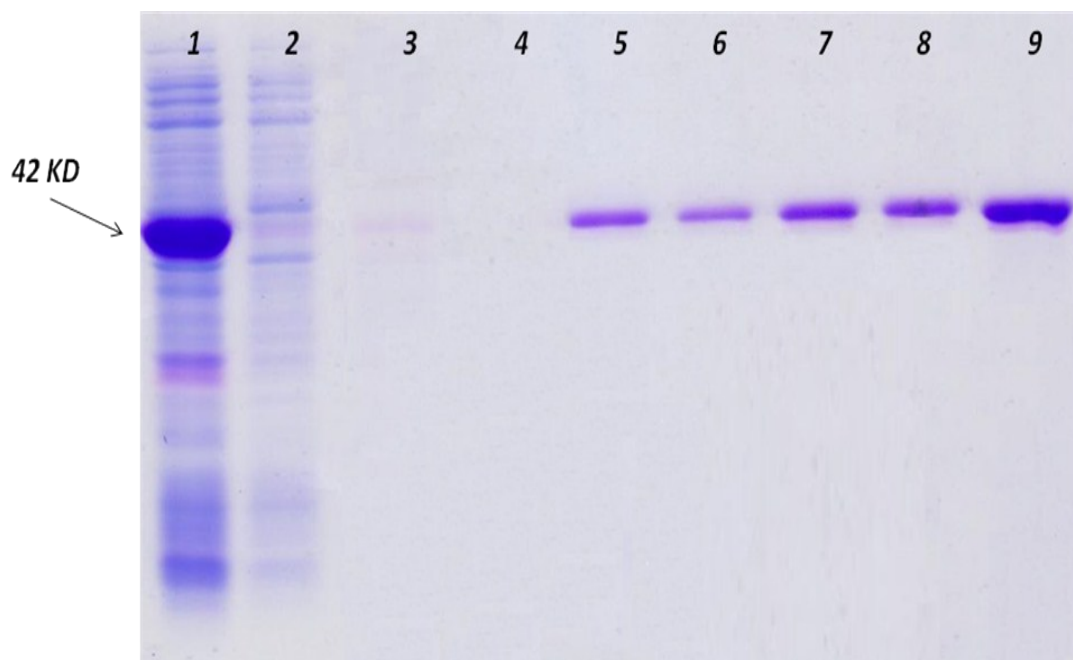
S5. Magnetization curves for the prepared MnFe_2O_4 (a) and $\text{MnFe}_2\text{O}_4@\text{SiO}_2@\text{NH}_2@2\text{AB-Ni}$ (b) at 40 °C.



S6. TGA curves of (a) $\text{MnFe}_2\text{O}_4@\text{SiO}_2@\text{NH}_2$, (b) $\text{MnFe}_2\text{O}_4@\text{SiO}_2@\text{NH}_2@2\text{AB}$, and (c) $\text{MnFe}_2\text{O}_4@\text{SiO}_2@\text{NH}_2@2\text{AB-Ni}$.



S7. EDX spectrum of $\text{MnFe}_2\text{O}_4@\text{SiO}_2@\text{NH}_2@2\text{AB-Ni}$.



S8. SDS-PAGE analysis of 6× His-tagged protein-A purification by MnFe₂O₄@SiO₂@NH₂@2AB-Ni magnetic nanoparticles. Lane 1: SCE, Lane 2: Flow through, Lane 3: W₁, Lane 4: W₄, Lane 5: E₁₀₀, Lane 6: E₁₀₀, Lane 7: E₂₅₀, Lane 8: E₂₅₀, Lane 9: E₅₀₀.