

Supplementary Information

An Impedimetric Ammonia Sensor based on Nanostructured α -Fe₂O₃

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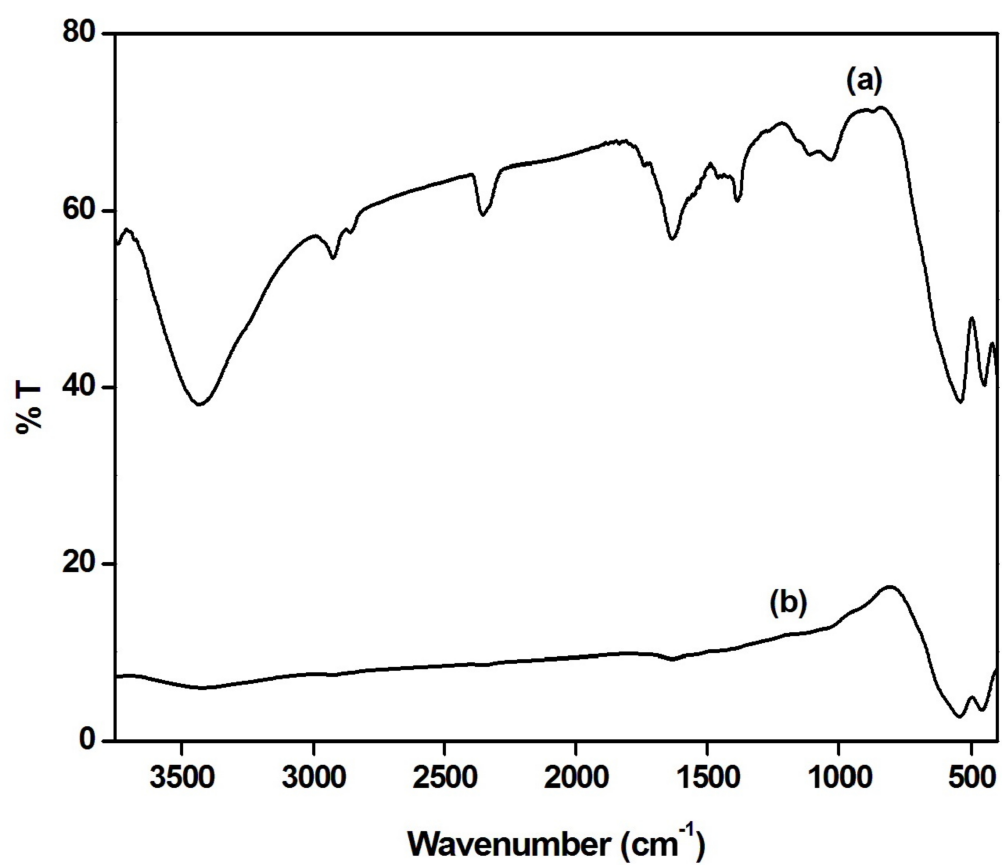


Fig. S1 FTIR spectrum of α -Fe₂O₃ (a) as-prepared (b) 600 °C annealed sample.

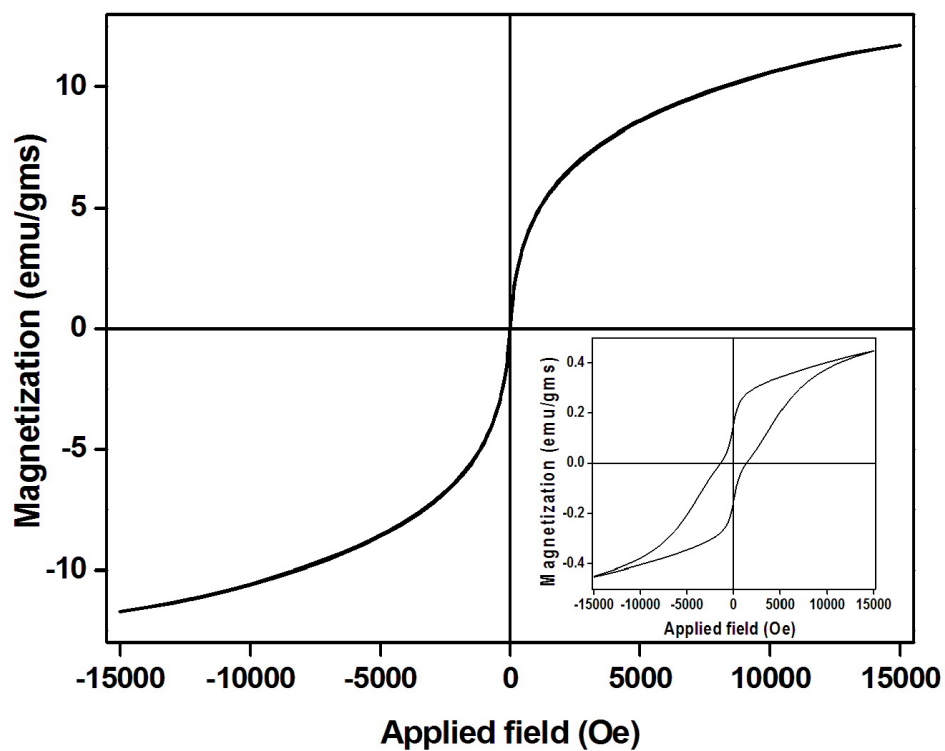


Fig. S2 M-H plot of as-prepared $\alpha\text{-Fe}_2\text{O}_3$. Inset shows the M-H plot of 600 °C annealed $\alpha\text{-Fe}_2\text{O}_3$ sample.

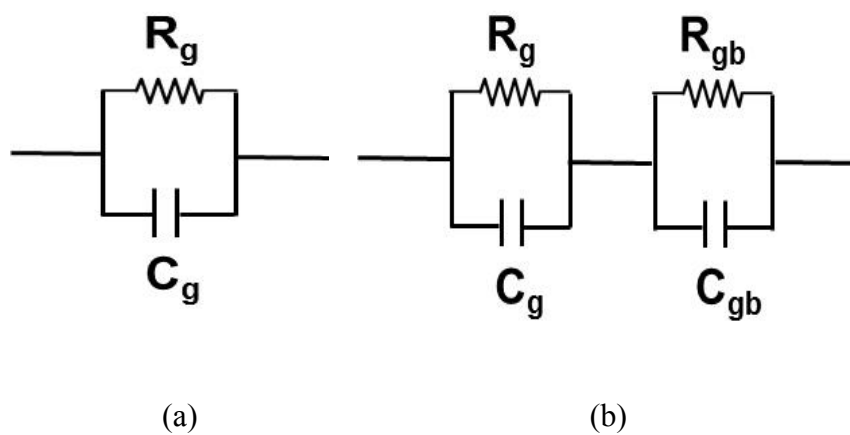


Fig. S3 Equivalent circuit used for the analysis of impedance data measured in (a) air and (b) the presence of ammonia.

R_g - Grain resistance;

C_g - Grain capacitance

R_{gb} - Grain boundary resistance; C_{gb} - Grain boundary capacitance

Table S1 Comparison of the standard JCPDS data (No. 86-0550) of α -Fe₂O₃ with the XRD data of as-prepared and 600 °C annealed samples.

Standard JCPDS data		as-prepared	600 °C annealed
		α -Fe ₂ O ₃	α -Fe ₂ O ₃
(h k l)	2 θ	2 θ	2 θ
(012)	24.14	-	24.13
(104)	33.16	33.13	33.13
(110)	35.62	35.57	35.62
(113)	40.86	-	40.85
(024)	49.46	49.40	49.46
(116)	54.07	54.03	54.05
(122)	57.44	-	57.47
(214)	62.43	-	62.44
(300)	63.99	-	63.99

Table S2 Magnetic parameters calculated from the M-H plot of α -Fe₂O₃ samples

Sample	Spontaneous magnetization (emu/g)	Coercivity (Oe)	Remanent magnetization (emu/g)
as-prepared	8.14	11	0.15
600 °C annealed	0.32	1387	0.15

Table S3 Maximum Z'' value obtained for 600 °C annealed α -Fe₂O₃ pellet sensor at different concentrations of ammonia.

Ammonia concentration (ppm)	Maximum Z'' value (ohm)
100	3.69×10^5
200	2.41×10^5
300	7.40×10^4
400	5.05×10^4
500	4.32×10^4
600	1.39×10^4
700	1.04×10^4
800	4.21×10^3
900	2.76×10^3
1000	2.33×10^3

Table S4 Electrical equivalent circuit parameters extracted from the impedance data obtained for 600 °C annealed α -Fe₂O₃ pellet sensor in air and at different concentration of ammonia.

Air/ concentration of ammonia in ppm	R _g (ohm)	R _{gb} (ohm)	C _g (F)	C _{gb} (F)
Air	-	2.047×10^8	-	1.305×10^{-10}
100	3.629×10^5	7.640×10^5	1.424×10^{-11}	1.836×10^{-10}
200	1.468×10^5	4.883×10^5	1.942×10^{-11}	1.891×10^{-10}
300	1.305×10^5	9.562×10^4	2.340×10^{-11}	2.158×10^{-10}
400	8.773×10^4	5.232×10^4	2.351×10^{-11}	2.705×10^{-10}
500	8.659×10^4	7.317×10^3	2.627×10^{-11}	4.443×10^{-9}
600	2.432×10^4	3.018×10^3	2.826×10^{-11}	1.207×10^{-8}
700	1.486×10^4	2.638×10^3	3.468×10^{-11}	1.862×10^{-8}
800	6.890×10^3	5.038×10^2	1.405×10^{-10}	1.970×10^{-8}
900	1.083×10^3	4.340×10^2	2.774×10^{-8}	1.965×10^{-8}