Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information

Magnetic leathers†

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Fig. S1 Digital images showing the incorporation of (a) IONP and (b) CMP particles with the bottom coat solution.

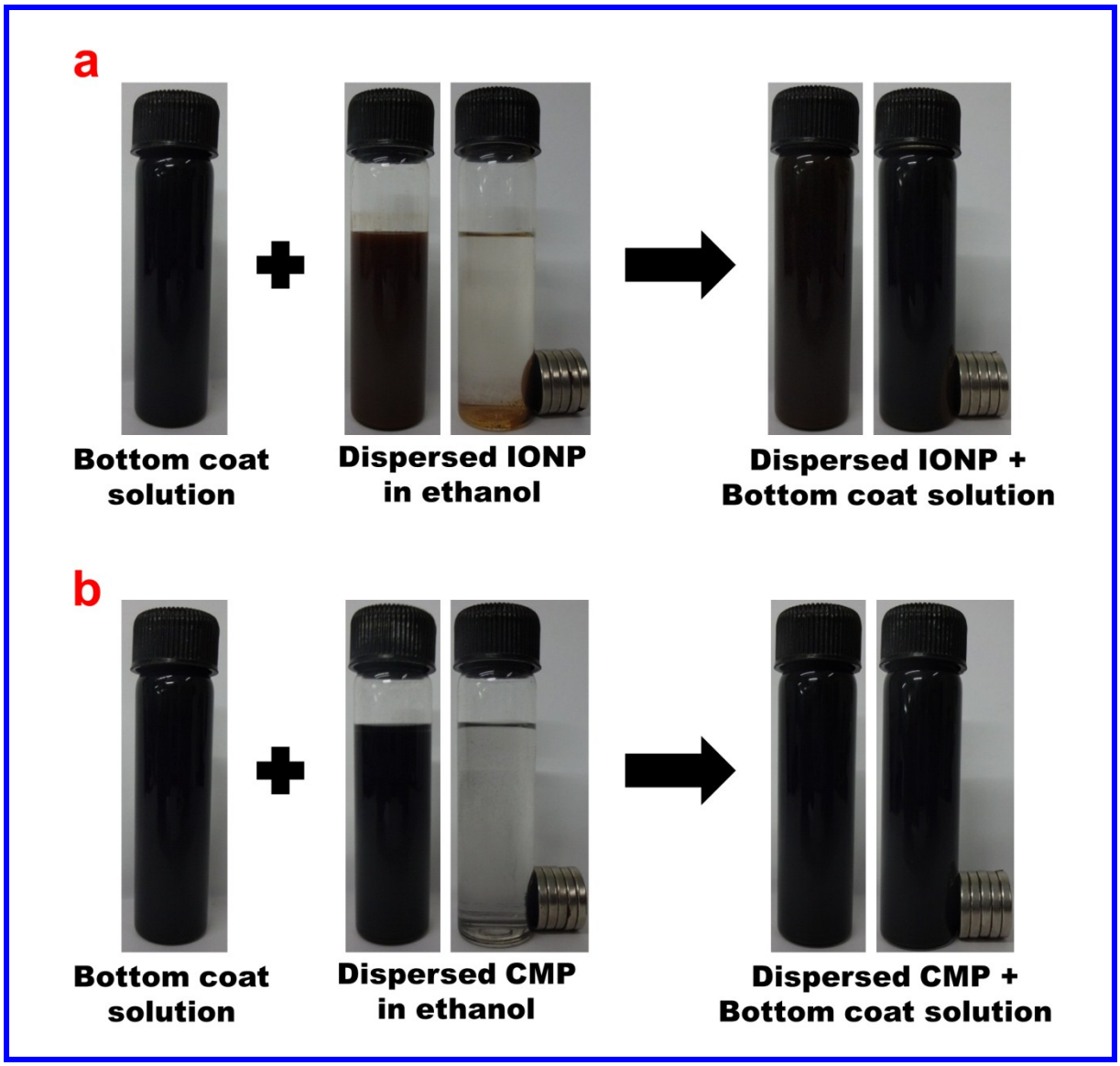

Fig. S2 HRSEM image showing the surface morphology of as-synthesized iron oxide nanoparticles with particle size.

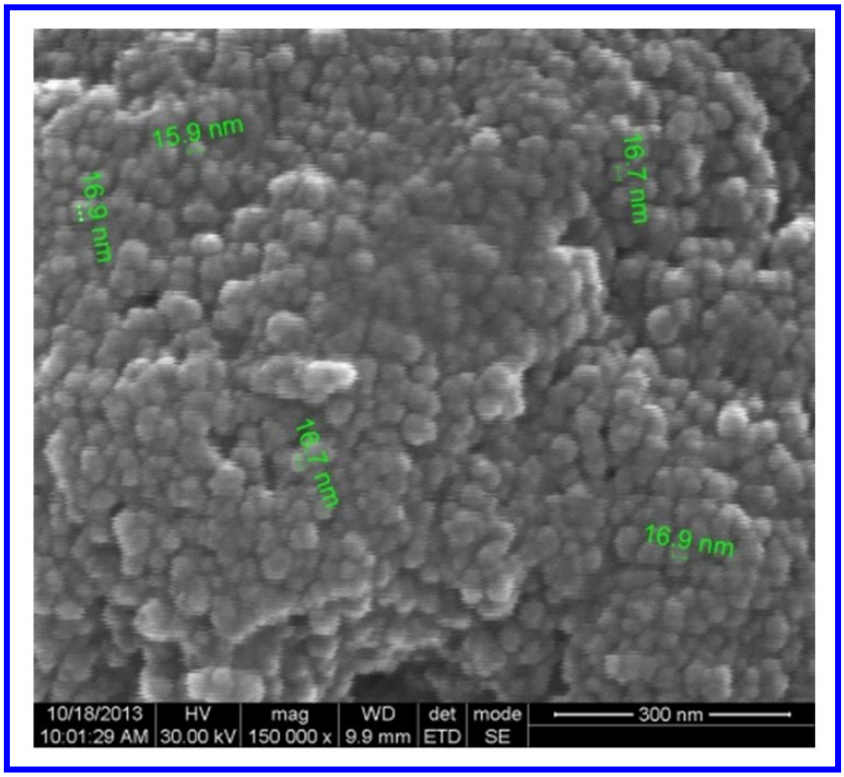

Fig. S3 Coercivity of as-synthesized Fe_3O_4 nanoparticles in magnified M-H curve probed using a vibrating sample magnetometer.

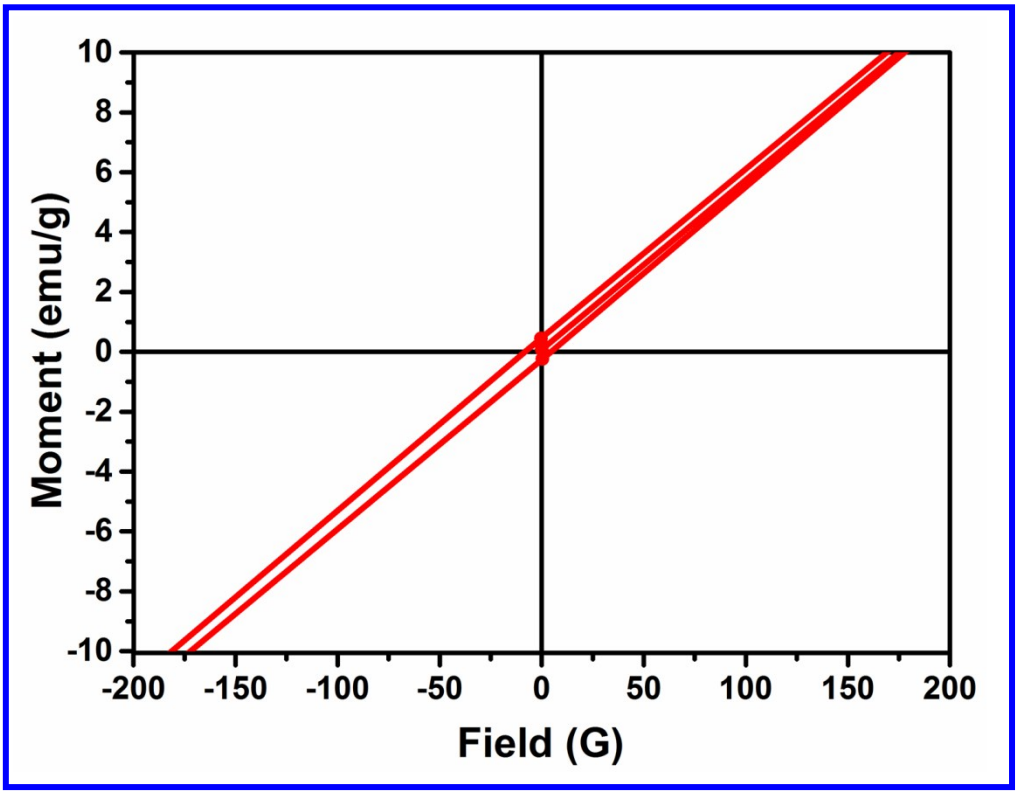

Fig. S4 XRD pattern of control cow crust leather after surface coating without any IONP or CMP particles.

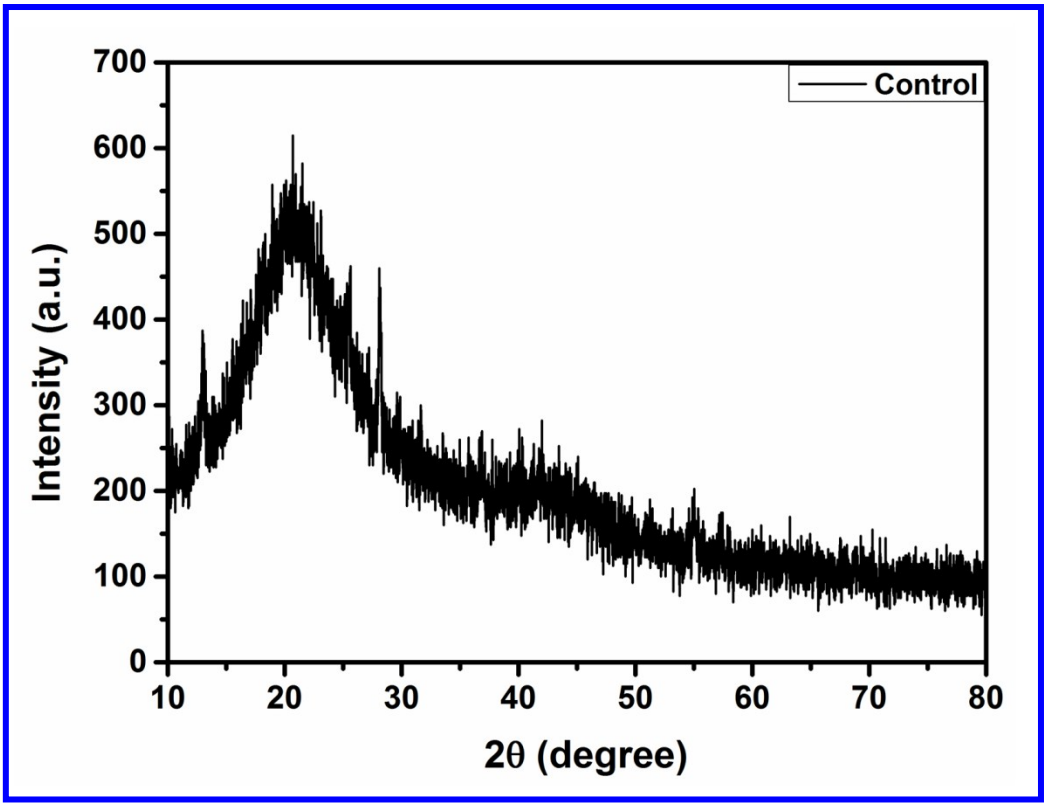

Fig. S5 HRSEM images showing the surface of (a) IONP and (b) CMP coated leathers at higher magnification.

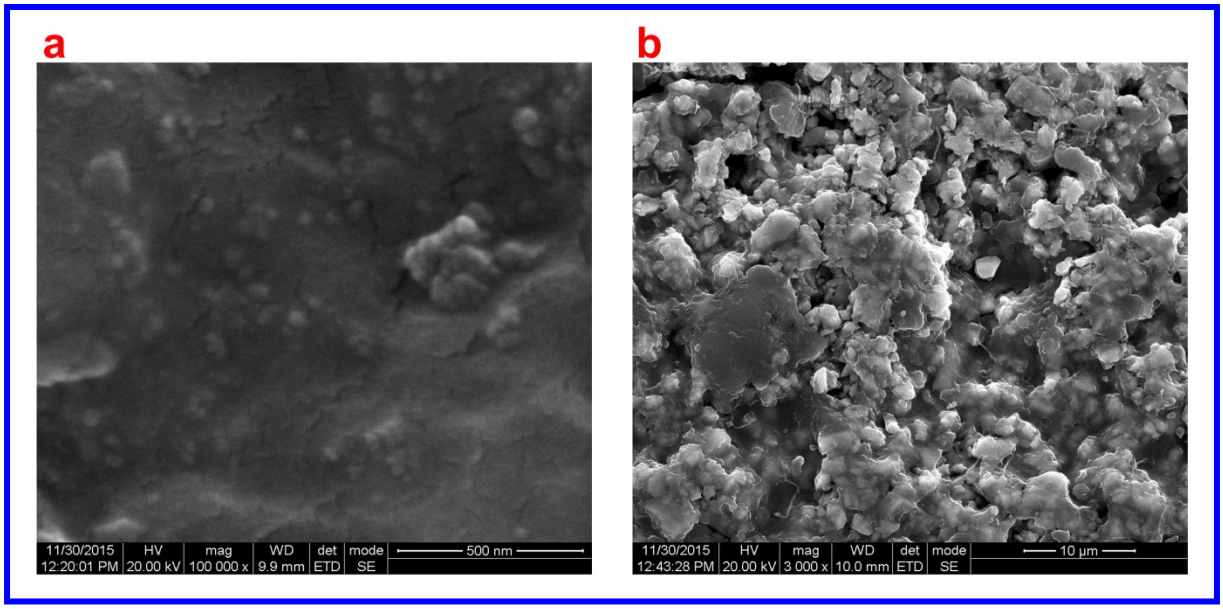

Table S1 Magnetic properties of commercial magnetic pigment

Properties	CMP
Coercivity, G	226
Specific Remanent Magnetisation, emu/g	32
Spec. Max. Magnetisation, emu/g	83
Relative Remanence, σ_r/σ_m	0.38

Table S2 Technical details of commercial leather finishing (surface coating) chemicals used in this study (procured from M/s Stahl India Pvt. Ltd., Chennai)

Technical data	Protein binder (BI – 1352)	Resin binder (RA – 2312)	PU (WT – 2564)	Feel modifier (HM – 145)	Wax filler (FI – 50)	Black pigment (PP – 18-032)	Nitrocellulose lacquer (LW – 65-000)
Image							
Description	Modified protein dispersion	Self-crosslinkable acrylic co-polymer emulsion	High gloss aliphatic polyurethane dispersion	Solvent-borne silicone solution	Aqueous wax emulsion	Jet black, pigment dispersion in a protein binder system	Clear high solids NC lacquer emulsion – DOP/DBP Free
Appearance	Beige/opaque/ liquid	White/slightly opaque/liquid	Beige grey/semi transparent/ liquid	Grey white/ transparent/ liquid	Beige/slightly opaque/liquid	Jet black/opaque/ liquid	Milky white
Solids (%)	~ 21	~ 35	~ 33	~ 10	~ 7.5	~ 26	~ 12.5

Viscosity (m.Pa.s, 20°C)	4000	< 25	100	< 15	200	300	600 - 1200
pH	8.5	7.8	8.8	-	9.5	9.5	-
Specific gravity (kg/m^3)	1030	1000	1050	900	1000	1020	930 - 950
(Film) Hardness	Medium hard	Medium soft	Hard	Medium hard	Medium soft	-	-
Gross ratio	-	-	Very bright	-	-	-	-
Flash point (°C)	-	-	-	32	-	-	-
Pigment type	-	-	-	-	-	Carbon black	-
Gloss (%)	-	-	-	-	-	-	>70

Table S3 Flexing resistance of control leather samples cut along and across the backbone direction at dry and wet conditions

No. of cycles	Control			
	Along - dry	Across - dry	Along - wet	Across - wet
10,000	A	A	C	C
20,000	A	A		
30,000	A	A		
40,000	A	A		
50,000	A	A		
60,000	A	A		
70,000	A	A		
80,000	A	A		
90,000	A	B		
1,00,000	B	B		

A: no effect; B: slight creasing; C: slight pipiness

Table S4 Flexing resistance of IONP coated leather samples cut along and across the backbone direction at dry and wet conditions

No. of cycles	IONP			
	Along - dry	Across - dry	Along - wet	Across - wet
10,000	A	A	B	B
20,000	A	A		
30,000	A	A		
40,000	A	A		
50,000	A	A		
60,000	A	A		
70,000	A	A		
80,000	A	A		
90,000	A	A		
1,00,000	B	B		

A: no effect; B: slight creasing; C: slight pipiness

Table S5 Flexing resistance of CMP coated leather samples cut along and across the backbone direction at dry and wet conditions

No. of cycles	CMP			
	Along - dry	Across - dry	Along - wet	Across - wet
10,000	A	A	B	B
20,000	A	A		
30,000	A	A		
40,000	A	A		
50,000	A	A		
60,000	A	A		
70,000	A	A		
80,000	A	A		
90,000	A	A		
1,00,000	A	A		

A: no effect; B: slight creasing; C: slight pipiness

List of Supporting Movies

Movie S1 Video showing the response of control and magnetic leathers (treated with IONP and CMP particles) under magnetic field generated using permanent magnets (~1500 Oe).

Movie S2 Video showing the response of control and magnetic leathers (treated with IONP and CMP particles) under magnetic field generated using an electromagnet fabricated using an iron screw and insulated copper wire.