Supporting Information

Static and dynamic magnetic properties and effect of surface chemistry on the morphology and crystallinity of $DyCrO_3$ nanoplatelets

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Characterization methods:

Powder X-ray diffraction (XRD) patterns were collected using PANalytical XPERT PRO instrument using iron filtered Cu - Kα radiation (λ = 1.5406 Å) in the 2θ range of 20 – 80º with a step size of 0.02°. The size and morphology of the prepared particles were obtained by using FEI Technai F30 high resolution transmission electron microscope (HRTEM) operated at 300 keV accelerating voltage. To understand the effect of chelating agent on the morphology, HRTEM was performed on DCO (C) and DCO (O) nanoparticles. X-ray photoelectron spectroscopy (XPS) data was collected using VG Microtech, model ESCA 3000 equipped with ion-gun (EX-05) for cleaning the surface. The binding energy resolution was 0.1 eV; however the overall resolution was limited to the bandwidth of X-ray source (~1 eV). Here, we used Shirley algorithm for background correction and chemically distinct species were resolved using a non-linear least square fitting procedure.

Static and dynamic magnetic property measurements of DCO nanoparticles were performed using a Physical Property Measurement System (PPMS) from Quantum Design Inc., San Diego, California equipped with a 9 Tesla superconducting magnet. We performed dc-magnetization vs. temperature (M -T) and magnetization vs. magnetic field (M–H)

measurements using a vibrating sample magnetometer (VSM) attachment and ac-susceptibility measurements were performed using an ACMS attachment. For dc-magnetic measurements, the DCO nanoparticles were precisely weighed and packed inside a plastic sample holder which fits into a brass sample holder provided by Quantum Design Inc. with negligible contribution in overall magnetic signal. We collected M–H loops at a rate of 75 Oe/s in a field sweep from - 50 to 50 kOe at the vibrating frequency of 40 Hz at 10, 50, 100, 125, 150 and 300 K to scan the behavior around the phase transitions observed in bulk phase. Before each measurement, the sample was heated above its reported Néel temperature to completely demagnetize the sample. Also, the M-T measurements were carried out in temperature range from 3–300 K at 100 Oe. The cooling and heating rates were kept constant at 2 K/min for all the measurements. For zero field cooled (ZFC) magnetic measurements, the sample was first cooled from 300 to 3 K in zero magnetic field and data was collected in heating mode once the field was applied at 3 K. At 300 K, the desired field was applied and data were recorded while cooling down to 3 K and heating back from 3 to 300 K. These curves obtained were designated as field cooled (FC) cooling and field cooled heating respectively. The ac-magnetic measurements were carried out at frequency range 101 to 9999 Hz at 10 Oe ac amplitude field.

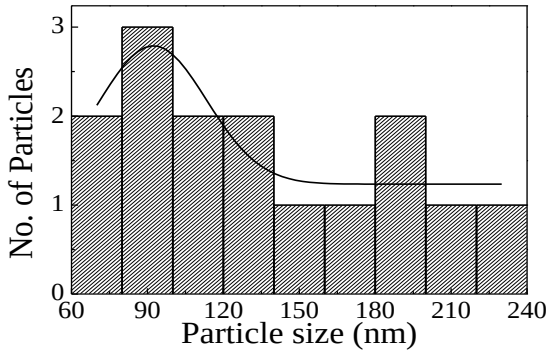

Figure S1. Particle size distribution of DCO (C) nanoplatelets.

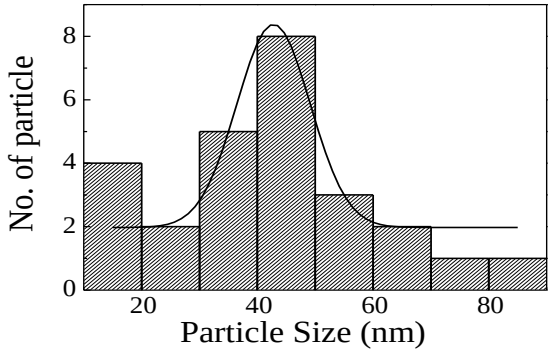

Figure S2. Particle size distribution of DCO (O) nanoplatelets.

Table S1: Lattice parameters of $DyCrO_3$ nanoparticles.

	Citrate gel			**Oxalate gel**		
Lattice parameters (Å)→	***a***	***b***	***c***	***a***	***b***	***c***
Decomposition Temperature (ºC) ↓						
800	5.177	5.481	7.549	5.198	5.500	7.548

Table S2: Magnetic transitions obtained from the DC magnetic measurements of the $DyCrO_3$ nanoplatelets in comparison with published data.

Transition temperature	**DCO (C)**	**DCO(O)**	**$DyCrO_3$ single crystal**	**Bulk $DyCrO_3$**	**Sub micron $DyCrO_3$ particle**
T_{N1} (K)	144	146	142 [33]	146 [32]	145 [50]
T_{N2} (K)	-	-	2 [33]	2.2 [32]	-
T_N ($DyCrO_4$) (K)	-	22	-	-	-

Table S3: Coercivity versus Temperature for DCO (C) and DCO (O) nanoplatelets.

Temperature (K)	**H_C (Oe) DCO(C)**	**H_C (Oe) DCO(O)**
125	830	1140
100	840	1520
10	565	930