Electronic Supplementary Material (ESI) for Physical Chemistry Chemical Physics.

Synthesis and Characterization of $KOsO_4$, a $5d^1$ quantum magnet oxide

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Table S1. Structural Parameters for $KOsO_4$ refined using a combined powder X-ray and Neutron data set.

Space Group	*I41/a* (Origin 2)
a (Å)	5.67586(1)
c (Å)	12.71914(1)
Volume (Å^3)	409.7531
K fractional coordinates	0 ¼ 5/8
Os fractional coordinates	0 ¼ 1/8
O fractional coordinates	0.1196(4) 0.0214(4) 0.1978(2)
K Biso (Å^2)	1.85(5)
Os Biso (Å^2)	1.41(1)
O Biso (Å^2)	2.59(4)
Os – O Bond Length (Å)	1.732(2)
Os BVS	7.20(3)
Chi^2 SXRD	2.96
Chi^2 NPD	1.72

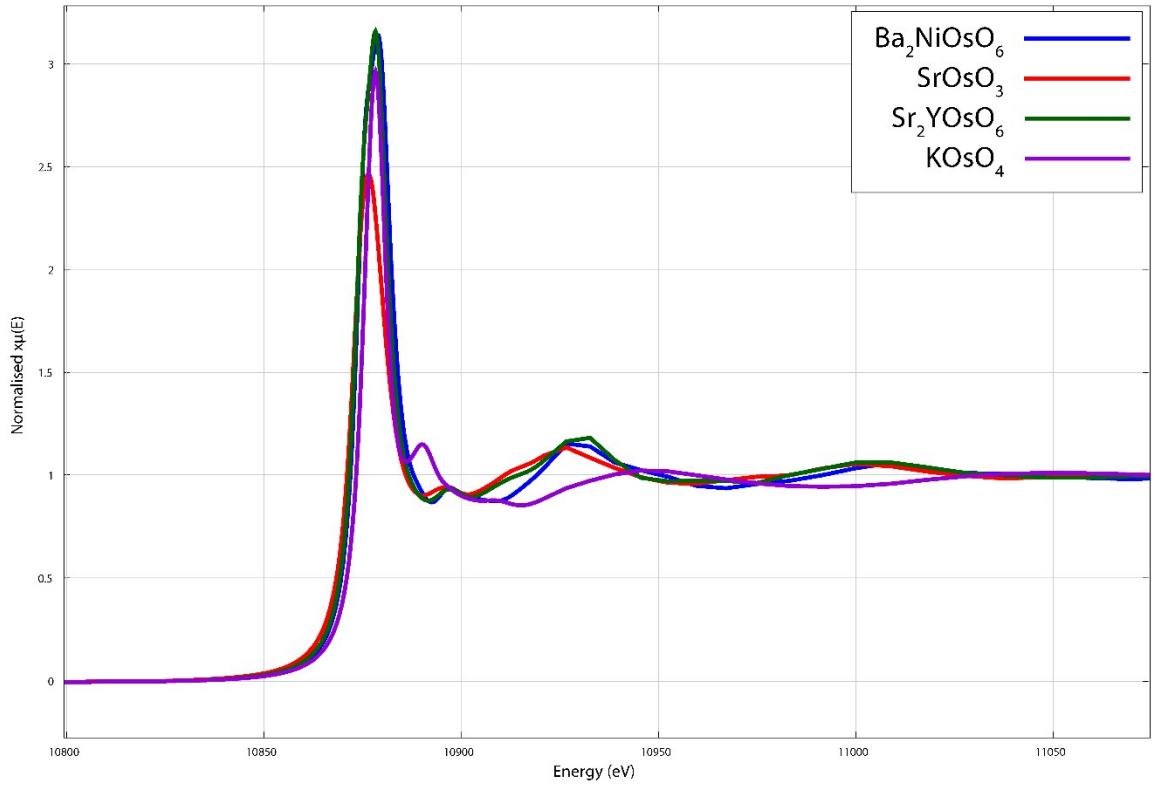


Figure S1. Normalised X-ray absorption spectrum for $KOsO_4$ measured at room temperature. The spectra of standards are included.

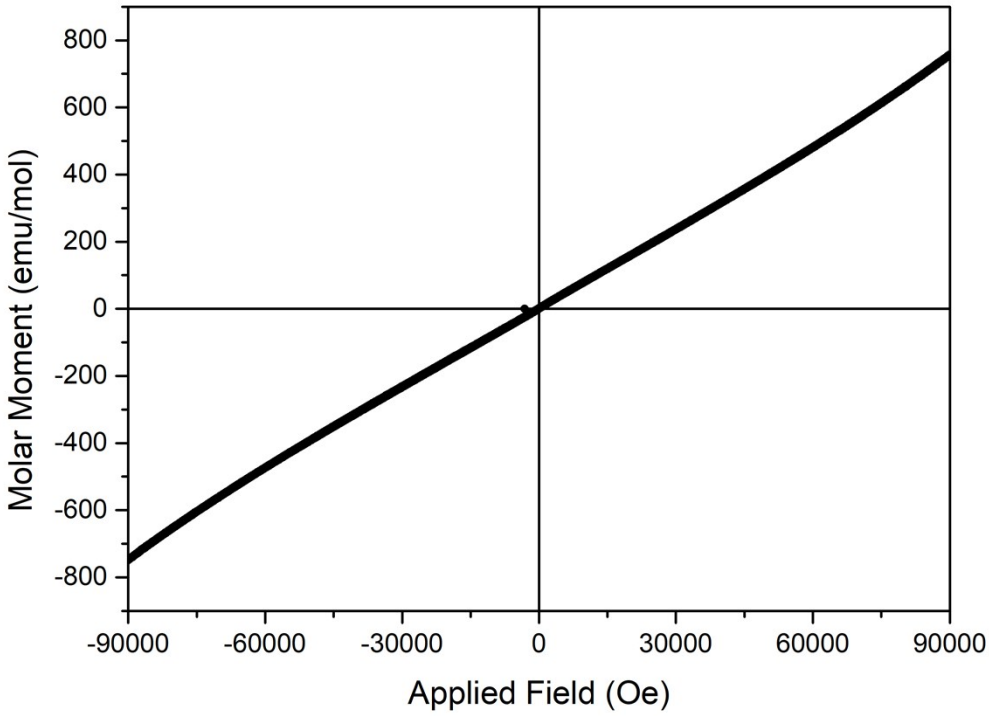
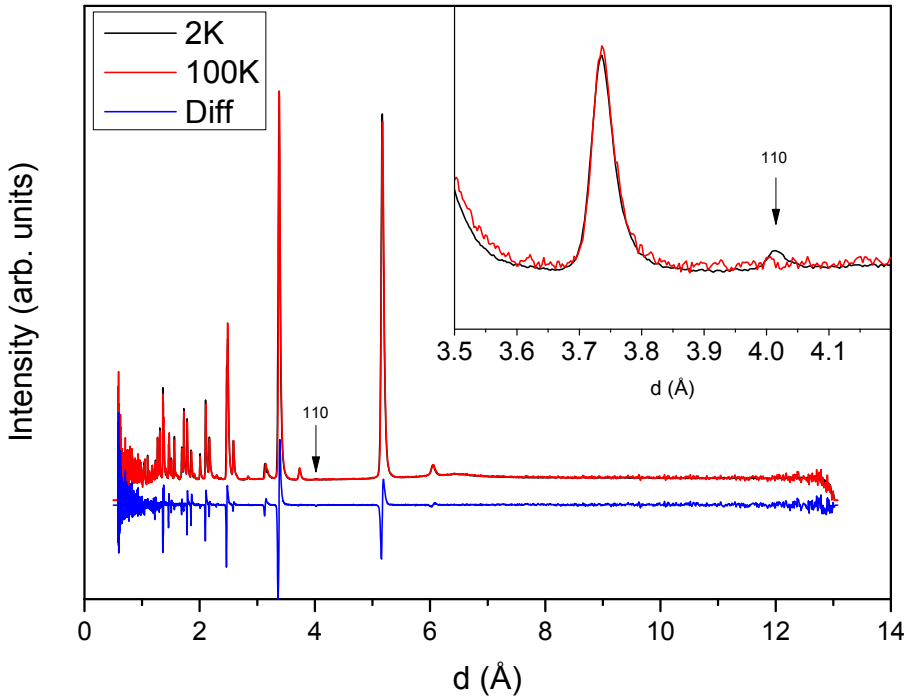


Figure S2. Isothermal magnetisation loop for $KOsO_4$ measured at 2K



S3. Low temperature, 2 and 100 K, neutron diffraction patterns of $KOsO_4$. The difference in the two patterns is shown. The inset highlights the appearance of the (110) magnetic reflection at low temperatures.

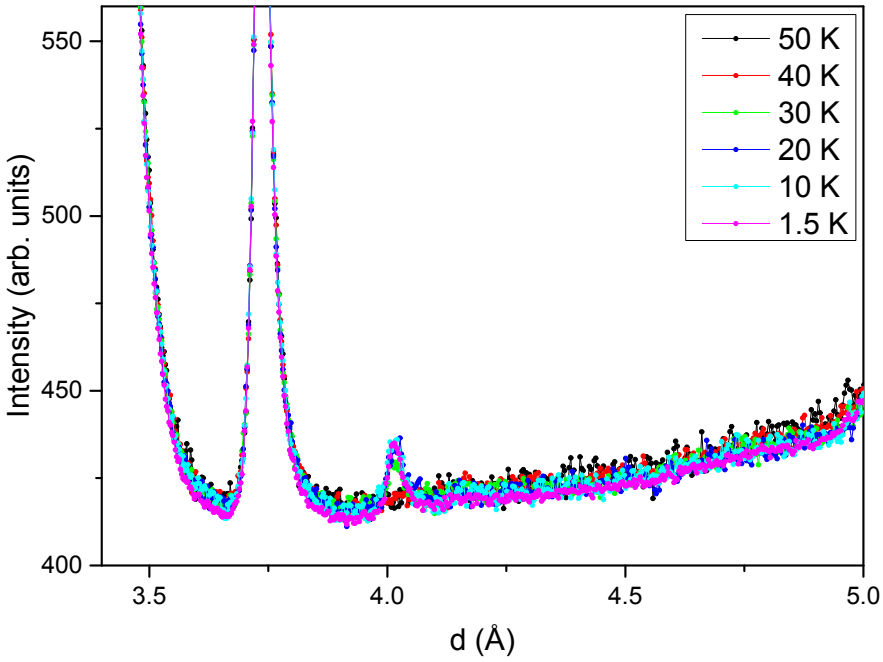
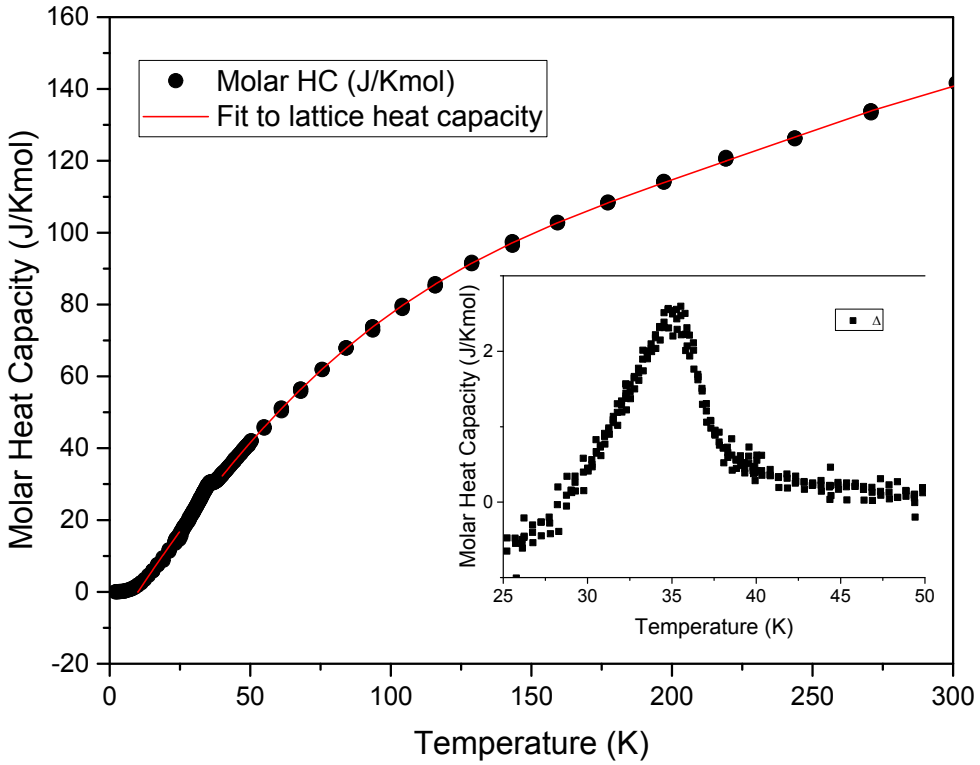
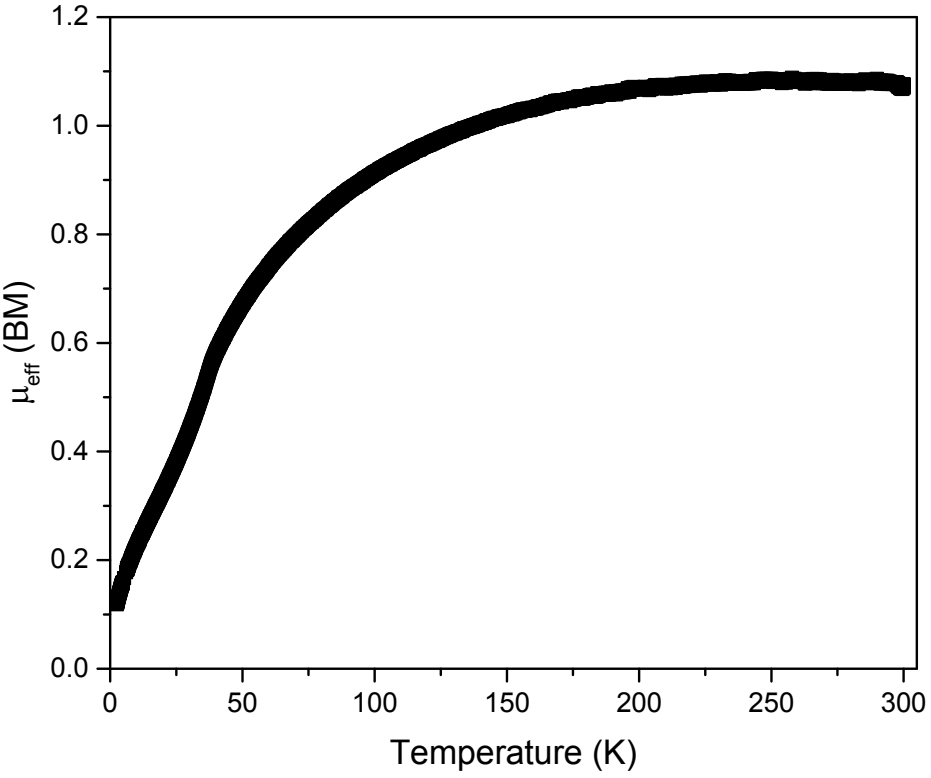


Figure S4. Temperature dependence of the neutron diffraction profiles for $KOsO_4$ illustrating the appearance of the (110) reflection near 4d = 4.0 Å.



S5. Molar Heat Capacity for $KOsO_4$. The solid line is the estimated lattice contribution and the inset shows the λ like response.



S5. Temperature dependence of the magnetic moment for $KOsO_4$.