

# Monopoles and Magnetricity in Spin ice

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## Abstract

The analogy between spin configurations in spin ice materials like  $\text{Ho}_2\text{Ti}_2\text{O}_7$  and proton configurations in water ice,  $\text{H}_2\text{O}$ , has been appreciated for many years (see Bramwell and Gingras, *Science*, 294, 1495, 2001). However it is only in the last few years that this equivalence has been extended into the realm of electrodynamics. In this talk I shall describe our recent experimental work that identifies magnetic charges (“monopoles”), transient magnetic currents (“magnetricity”) and the universal properties expected of an ideal magnetic Coulomb gas (magnetic electrolyte - “magnetolyte”). These universal properties include the Onsager-Wien effect, “corresponding states” behaviour, Debye-Huckel screening and Bjerrum pairing. I will describe experimental results for both traditional spin ice materials ( $\text{Ho}_2\text{Ti}_2\text{O}_7$ ,  $\text{Dy}_2\text{Ti}_2\text{O}_7$ ) and a recently discovered system ( $\text{Dy}_2\text{Ge}_2\text{O}_7$ ).