

Magnetic monopoles under pressure in spin ice

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ABSTRACT: In the world of condensed matter physics, there has been a flurry of activity centered on the existence of “magnetic monopoles” in a strange group of materials known as spin ices. While the idea of a magnetic monopole has been around for quite some time (using magnetic “charge” as a computational tool since the time of Faraday), the theoretical grounding for magnetic monopoles was not made clear until the work of Paul Dirac. In this talk, I will outline the historical development of the idea of a magnetic monopole, and then discuss how monopoles (and Dirac strings) manifest themselves in spin ice systems. Recent work on new germanate spin ices synthesized via high pressure techniques, in which there is a high density of monopoles, will be mentioned, and the application of an idea in physical chemistry (the Debye-Hückel equation) will be shown to be an excellent approximation to describing monopoles as a magnetic “electrolyte” solution. [1], [2], [3] New pyrochlore compounds will also be discussed and compared to their titanate analogues to show how exotic magnetism arises from frustrated systems under chemical pressure. [4], [5], [6]

- (1) H. D. Zhou et al, Nature Communications, 2011.
- (2) H. D. Zhou et al, Physical Review Letters, 2012.
- (3) A. M. Hallas et al, Physical Review B, 2012.
- (4) Z. Dun et al, Physical Review B, 2014.
- (5) X. Li et al, Physical Review B, 2014.
- (6) A. M. Hallas et al, Phys. Rev. Lett., 2015.

ALL ARE WELCOME!!!