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Slow spin relaxation and zero point entropy in diluted and stuffed rare earth pyrochlores¹

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Work on the cooperative paramagnet $Tb_2Ti_2O_7$, and on the spin ices $Dy_2Ti_2O_7$ and $Ho_2Ti_2O_7$ has exposed new avenues of study into the nature of excitations and ordering in geometrically frustrated magnetic systems. Here, we will present low temperature AC susceptibility, magnetization, and heat capacity data on these materials, and on their diluted and stuffed variants, formed either by replacing some magnetic rare earth ions with non-magnetic Y or Lu , or by replacing some Ti with magnetic Ln ions. Experimental results on diluted $Tb_2Ti_2O_7$ and $Dy_2Ti_2O_7$ will be discussed, which indicate the existence of slow spin relaxations ($\tau \geq 0.001s$) in both systems, but with opposing characters [1,2]. For the stuffed materials, we will show that additional Ln ions cause the effective magnetic interaction to become stronger and increasingly antiferromagnetic. Additionally, low temperature AC susceptibility and heat capacity data will be presented to compare the different effects of stuffing on the ground states of the materials [3].

[1] *Phys. Rev. Lett.* **96**, 027216 (2006).

[2] *Phys. Rev. Lett.* **91**, 107201 (2003).

[3] *Nature Phys.* **2**, 249 (2006).

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