Thermoelectric properties of Na$_{0.68}$CoO$_2$ on a 2D triangular lattice

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University of California Santa Cruz — Na$_x$CoO$_2$ at $x = 0.68$ is a material with important and interesting thermopower. Using a new formalism for computing thermal response functions, via the response to dynamical temperature gradients, in the high frequency limit a nearly frequency independent term is identified for the thermopower $S^*$, the Lorentz ratio $L^*$, and the dimensionless figure of merit $Z^*T$. We calculate, via exact diagonalization for small systems, $S^*$, $L^*$, and $Z^*T$, at all temperatures for the $t$-$J$ model on a 2D triangular lattice exploring the model parameters relevant to the experiments by I. Terasaki et al, (PRB 56, R12685 (1997)) and Y. Wang et al, (Nature 423, 425 (2003)). Our objective is to understand the (large) magnitude of the thermopower, and its remarkable sensitivity to a magnetic field. We also consider the hypothetical and interesting case of the opposite sign of hopping $t 	o -t$. 

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