

**A three-dimensional phase transition model in ferromagnetism:  
existence and uniqueness**

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**Abstract**

We scrutinize both from the physical and the analytical viewpoint the equations ruling the paramagnetic-ferromagnetic phase transition in a rigid three dimensional body. Starting from the order structure balance, we propose a non-isothermal phase-field model which is thermodynamically consistent and accounts for variations in space and time of all fields (the temperature  $\theta$ , the magnetic field vector  $\mathbf{H}$  and the magnetization vector  $\mathbf{M}$ ). In particular, we are able to establish a well-posedness result for the resulting coupled system.