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The consequences of similarity of hysteresis loops for interpreting magnetic particle systems SERGIU RUTA, Physics Department, University of York, York, UK, ONDREJ HOVORKA, Faculty of Engineering and the Environment, University of Southampton, Southampton, UK, RYAN BOOTH, SARA MAJETICH, Physics Department, Carnegie Mellon University, Pittsburgh, PA, USA, ROY CHANTRELL, Physics Department, University of York, York, UK — One of the challenges in understanding interacting magnetic particle (MP) assemblies is the interpretation of their physical parameters from magnetization measurements. A common framework has been based on the Langevin function approach, applicable in the super-paramagnetic limit of weakly interacting MPs . If interactions are significant or in case of thermally blocked MPs the issue becomes complicated by the presence of memory effects and hysteresis, and the question of uniqueness of parameter identification arises. To study this question, we consider a kinetic Monte-Carlo model of dipolar interacting Stoner-Wohlfarth MP, including volume and anisotropy distributions. By applying the grid search methods combined with the least squares fitting approach we map the parameter regions of hysteresis loops indistinguishable within a statistical confidence. This allows to show that a unique extraction of model parameters is indeed possible only in a certain range of MP concentrations and temperatures. Thus the hysteresis loop similarity prohibits a reliable parameter identification - being a fundamental issue that may potentially be resolved only by devising different measurements protocols.

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