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Effect of magnetostatic interactions on the linear additivity of FORC diagrams

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First-order reversal curve (FORC) diagrams were modelled and experimentally measured for assemblages of single-domain magnetite particles with bimodal distributions of coercivity and varying concentration. When fitting end-member modelled FORC diagrams to modelled FORC diagrams of mixtures, linear additivity is obeyed for the non-interacting or weakly interacting mixtures, with predicted mixing ratios within 8% of the actual mixing ratios. Strongly interacting mixtures, having a concentration of magnetite larger than 15%, are not always linearly additive. Experimental bimodal mixtures of magnetite particles (single-domain + pseudo single-domain) have FORC diagrams that are linearly additive, regardless of the concentration in magnetite (1% or 10%). Micromagnetically modelled and measured FORC diagrams of mixtures of single-domain magnetite and single-domain hematite also show that linear additivity of the two end-member holds, whatever the spacing between particles. These results open the possibility of unravelling magnetic mixtures that have different coercivities using FORC diagrams as the end-members, say, to predict the proportion of hematite in a mixture of magnetite and hematite, provided that hematite is known to be present in sizeable amounts.