Barkhausen avalanches in thin films

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The magnetization process in thin films is due to the avalanche-like motion of domain walls, that can be recorded by magneto-optical methods. Here, I discuss experimental measurements of these Barkhausen avalanches in Permalloy thin films where zigzag domain walls are formed by the competition between long-range dipolar forces and the short-range line tension of the wall. The resulting avalanche distribution is affected by the limited size of the observation window requiring an appropriate correcting scheme. Next, I present results of numerical simulations of a dipolar random-field Ising model and of a flexible domain wall model that allow to reproduce the experimental results. By studying the avalanche size distribution, we observe a cross-over from a universality class dominated by line tension to another universality class where the long-range dipolar forces become important. This crossover is accompanied with a change of the domain wall morphology from a rough to a zigzag structure.

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