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Ferrimagnetic switching driven by stochastic resonance in multiferroic (Ge,Mn)Te

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The interplay between spin-orbit interaction (SOI) and magnetic order is currently one of the most active research fields in condensed matter physics. We report on ferrimagnetic switching driven by stochastic resonance in multiferroic (Ge,Mn)Te, investigated by x ray magnetic linear and circular dichroism (XMLD/XMCD), supported by SPR-KKR-CPA scattering and magnetic cluster calculations. In accordance with our previous resonant ARPES results, we find that the Mn-atoms occupy two distinct substitutional and interstitial lattice sites by substituting Ge-atoms. We show that (Ge,Mn)Te antiferromagnetically couples its Mn-sites with slightly different magnetic moments, resulting in a ferrimagnetic order. One of the astonishing results is that XMCD data show that the system spontaneously switches its magnetisation direction, without changing external parameters such as light helicity, applied B-fields or temperature (up to 65 K). The switching reveals ultra-slow magnetization dynamics, which can be governed by the stochastic resonance. Finally, we demonstrate that the occurrence of ferrimagnetic switching is closely related to the formation of topological spin textures in the films, enabled by the interplay of antiferromagnetic and Dzyaloshinskii-Moriya interactions.

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