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CORRECTION

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Correction: Ultrafast switching to zero field topological spin textures in ferrimagnetic TbFeCo films

Kaixin Zhu,[a,b] Linzhu Bi,[a,b] Yongzhao Zhang,[a,b] Dingguo Zheng,[a,b] Dong Yang,[a,b] Jun Li,[a] Huanfang Tian,[a] Jianwang Cai,[a] Huaixin Yang,[a,b,d] Ying Zhang*[a,c] and Jianqi Li*[a,b,c]

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Correction for 'Ultrafast switching to zero field topological spin textures in ferrimagnetic TbFeCo films' by Kaixin Zhu *et al.*, *Nanoscale*, 2024, **16**, 3133–3143, **https://doi.org/10.1039/D3NR04529C**.

The authors regret that there were several errors in the figures and equations in original article. The correct figures and equation are as shown herein. The authors confirm that the results and conclusions of the article are not affected by these changes.

(1) In the first paragraph of the article "Then we consider a family of functions $\theta(r) = \theta(r/\eta)$" should be corrected to "Then we consider a family of functions $\vartheta(r) = \vartheta(r/\eta)$".

(2) The units given for the vertical axis in Fig. 3c and 4b should be corrected from "10^{-6}J" to "10^{-16} J". The correct figures are as shown herein.

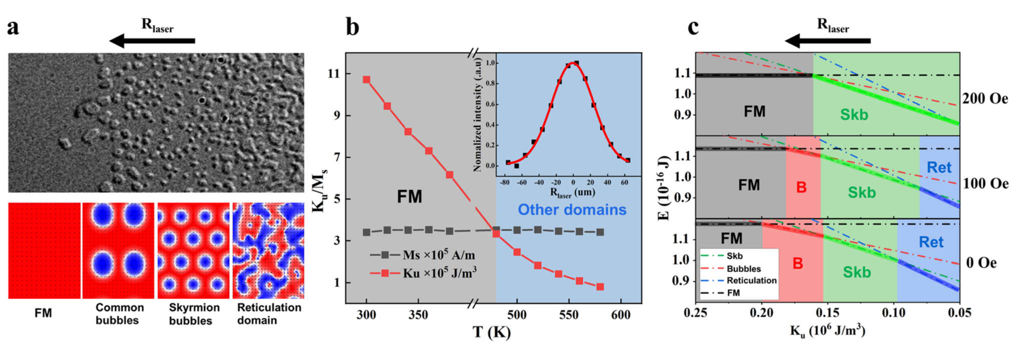

Fig. 3 Temperature dependent uniaxial anisotropy and energy simulation of uniaxial anisotropy correlation. (a) Top, magnified L-TEM image of yellow dashed box in Fig. 1e, indicates four different domain structures along the arrow direction. Bottom, corresponding magnetic structures in micromagnetic simulation. (b) Magnetic parameters measured at different temperatures. No significant change in the saturation magnetization, and uniaxial anisotropy decreases with an increase of temperature. Inset: Gaussian intensity distribution of fs laser pulses. (c) Energy of the four different states as a function of the uniaxial anisotropy under zero field and at the magnetic field with the direction perpendicular to the film: skyrmion bubbles (dotted green line), common magnetic bubbles (dotted red line), reticulation domain (dotted blue line) and FM state (dotted black line). The colored areas mark the different ground state areas, B stands for common magnetic bubbles, Skb stands for skyrmion bubbles and Ret stands for reticulation domain. With the increase of the magnetic field, the bubble domain transforms to the FM state and the reticulation domain transforms to skyrmion bubbles.

[a]*Beijing National Laboratory for Condensed Matter Physics, Institute of Physics, Chinese Academy of Sciences, Beijing 100190, China. E-mail: zhangy@iphy.ac.cn, ljq@iphy.ac.cn*
[b]*School of Physical Sciences, University of Chinese Academy of Sciences, Beijing 100049, China*
[c]*Songshan Lake Materials Laboratory, Dongguan, Guangdong, 523808, China*
[d]*Yangtze River Delta Physics Research Center Co., Ltd., Liyang, Jiangsu, 213300, China*

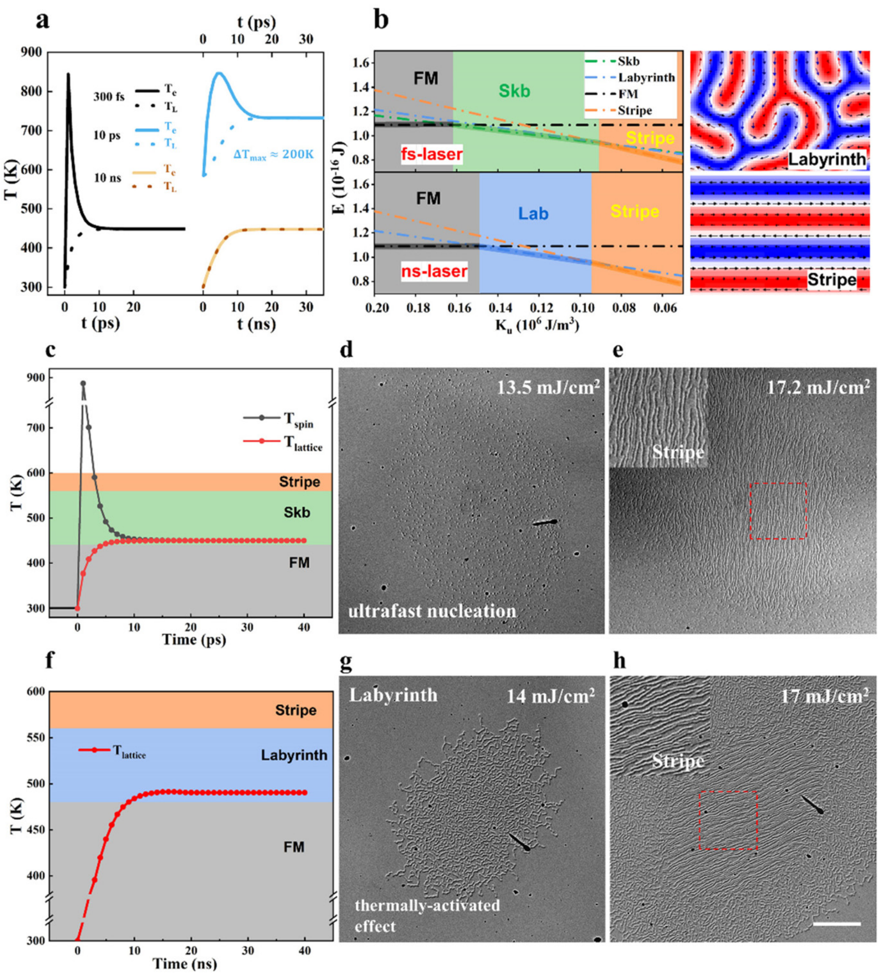

Fig. 4 Magnetization structure evolution in amorphous ferrimagnetic TbFeCo films *via* fs and ns laser manipulation. (a) Three temperature model calculations for three pulse durations, 300 fs,10 ps, and 10 ns at the films (solid and dashed lines for electronic and lattice temperatures, respectively. The spin temperature is not displayed), the laser fluence used for the simulation is 13 mJ cm^{-2}. (b) Left: energy of the four different states as a function of the uniaxial anisotropy: skyrmion bubbles (dotted green line), stripe domain (dotted orange line), labyrinth domain (dotted blue line) and FM state (dotted black line). The colored areas mark the different ground state areas. Lab stands for labyrinth domain and Skb stands for skyrmion bubbles, respectively. Right: labyrinth and stripe domains in micromagnetic simulation. (c) Simulated behavior of the fs laser pulse action, with equilibrium temperature stabilized in the skyrmion state, the laser fluence used for the simulation is 13 mJ cm^{-2}. (d and e) L-TEM images of the skyrmions and the stripe domains induced by a single 300 fs laser pulse. (f) Simulated behavior of the ns laser pulse action, where the final temperature is stabilized in the labyrinth domain. The solid dots represent the simulation points, the laser fluence used for the simulation is 14 mJ cm^{-2}. (g and h) L-TEM images of the labyrinth and stripe domains induced by a single 10 ns laser pulse. The scale bar in (d and e), (g and h) is 5 μm.

(3) In the "Fs and ns laser simulation" section of the Experimental part, the penetration depth *d* should be corrected from "50 nm" to "30 nm".

(4) In the "TIE analysis" and "Fs and ns laser simulation" sections of the Experimental part, there are typographical errors in the equations and a missing reference; the correct equations read as follows.

TIE analysis

The TIE equation is composed of the following two equations:[53]

$$\frac{2\pi}{\lambda}\frac{\partial I(x,y,z)}{\partial z} = -\nabla_{xy}\big(I(x,y,z)\nabla_{xy}\Phi(x,y,z)\big)$$

$$\nabla_{xy}\Phi(x,y,z) = -\frac{e}{\hbar}\big(\vec{M}\times\vec{n}\big)t$$

Fs and ns laser simulation

In addition, the longitudinal temperature gradients (normal to the surface) and the exponential decay of the source within the material were taken into account to provide a more accurate simulation.[59] The 3TM equations read as follows:

$$C_e(T_e)\frac{\partial T_e}{\partial t} = -G_{el}(T_e - T_l) - G_{es}(T_e - T_s) + Q(x,t)$$

$$C_s(T_s)\frac{\partial T_s}{\partial t} = -G_{es}(T_s - T_e) - G_{sl}(T_s - T_l)$$

$$C_l(T_l)\frac{\partial T_l}{\partial t} = -G_{el}(T_l - T_e) - G_{sl}(T_l - T_s)$$

$$Q(x,t) = 0.94\frac{(1-R)}{\delta t \cdot d}F\,\exp\left[-\frac{x}{d} - 2.77\left(\frac{t}{\delta t}\right)^2\right]$$

Ref. 59 was missing in the original article; the details are provided as ref. 1 below.

The Royal Society of Chemistry apologises for these errors and any consequent inconvenience to authors and readers.

References

1 A. N. Smith, J. L. Hostetler and P. M. Norris, *Numer. Heat Transfer, Part A*, 1999, **35**, 859–873.

