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• **Supplementary File** •

Perpendicular magnetic anisotropy based spintronics devices in Pt/Co stacks under different hard and flexible substrates

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Appendix A HR-TEM results in Ta/Pt/Co/Pt stacks

After obtained the HR-TEM images of Sub.(Si/SiO_2)/Ta (3)/Pt(3)/Co(0.9)/Pt(5) stacks, we test the sample after depositing the buffer Pt layer at 300℃. From Figure A1(b) we can saw that after high temperature deposition, the interface mixing intensifies, but the crystalline state was changed. In order to know the effect of buffer layer to the films, we deposited the Pt layer with the thickness of 20nm with the deposition temperature at 600℃ for 1h to get the (100) orientation. When the temperature decrease to the room temperature, we deposited the Ta (3)/Pt(3)/Co(0.9)/Pt(3) stacks on the Pt layer. The HR-TEM result showed that the multilayers can be induced to crystallize by the crystalline phase of Pt layer, which demonstrated that the buffer layer can effectively improve the overall performance of the films(Figure A1(c)), which was consistent with the previous report. [1, 2]

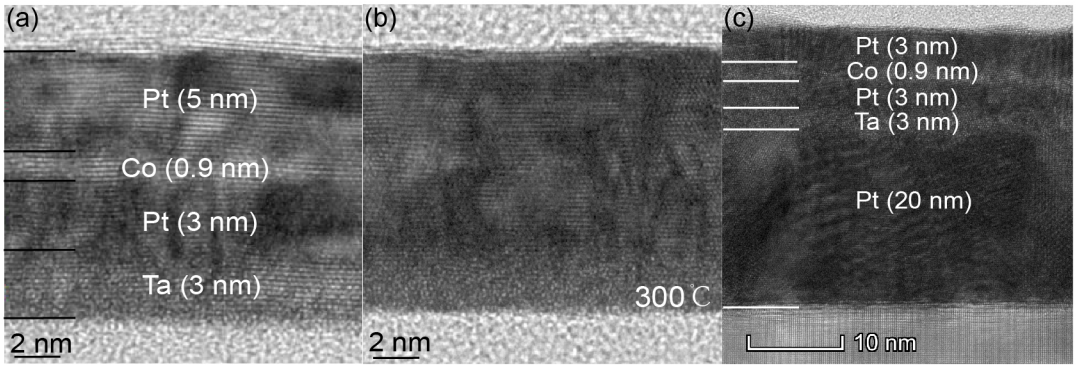

Figure A1 (a,b) The HR-TEM image of Sub.(Si/SiO_2)/Ta (3)/Pt(3)/Co(0.9)/Pt(5) with different deposition conditions: (a): Pt was deposited at room temperature; (b) Pt was deposited at 300℃. (c) The HR-TEM image of Sub.(MgO)/Pt(20)/Ta(3)/Pt(3)/Co(0.9)/Pt(3) with the first Pt layer annealing at 600℃ for 1h.

Appendix B More Magneto-optical Kerr microscope test images

In this section, we study the effects of different magnetic pulses and magnitudes on domain wall (DW) propagation using Magneto-optical Kerr microscope. On the one hand, in the Sub.(Al_2O_3)/Ta(3)/Pt(3)/Co(1.5)/Pt(3) stacks, when we applied more field pulse, the DW propagation accelerated as shown in Figure B1(a)-(d). On the other hands, when we increased the magnitude of filed we get the similar conclusions(Figure B1(e) and (f)), which was consistent with the previous report. [3, 4] For the Sub.(Pet)/Ta(3)/Pt(4.5)/Co(1)/Pt(3) stacks, the image of Magneto-optical Kerr microscope measurement was shown in Figure B2. We can see that after the field pulse, the propagation speed of the DW was very fast, which shows that the film has good magnetic moment switching performance, which was beneficial to be used in spin low power flexible devices.

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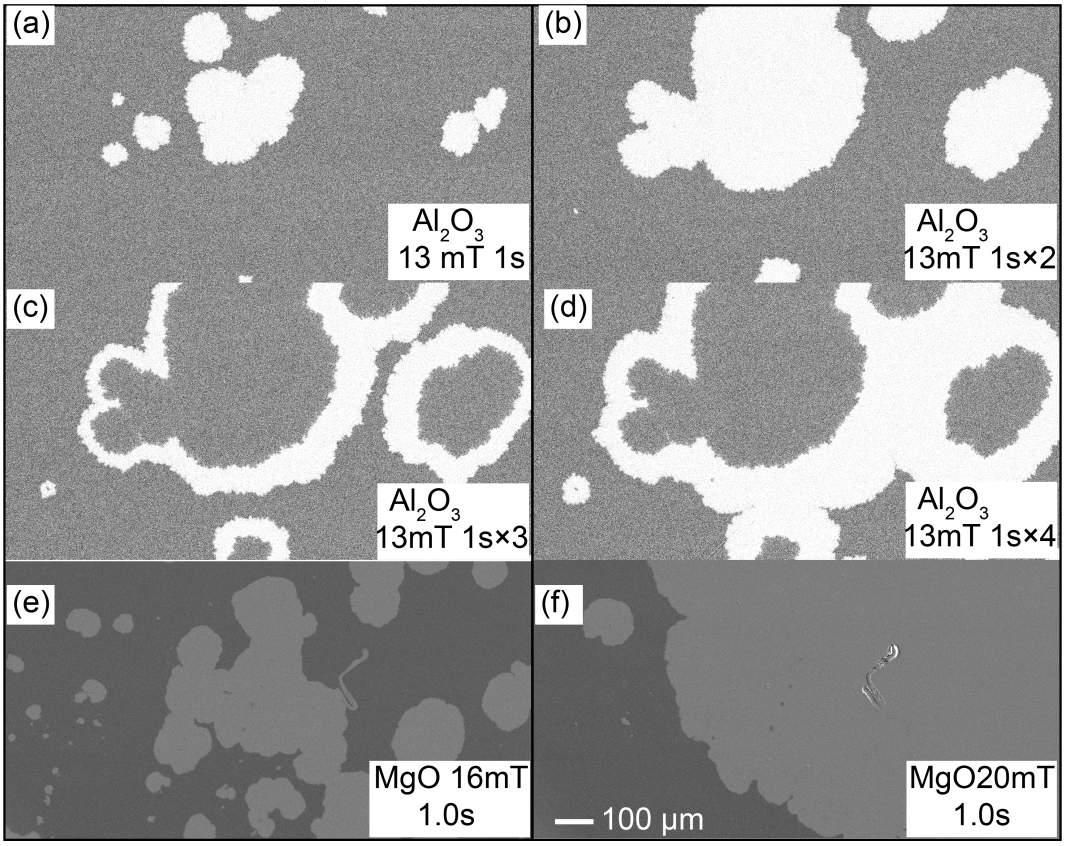

Figure B1 The Magneto-optic Kerr microscope image of selected sample.The image of Sub.(Al_2O_3)/Ta(3)/Pt(3)/Co(1.5)/Pt(3) stacks under the field of 13mT after different field pulses of 1s: (a) 1, (b) 2, (c) 3, (d) 4. The image of Sub.(MgO)/Ta(3)/Pt(3)/Co(1)/Pt(3) stacks under different fields after one field pulse of 1s: (e) 16 mT, (f) 20mT.

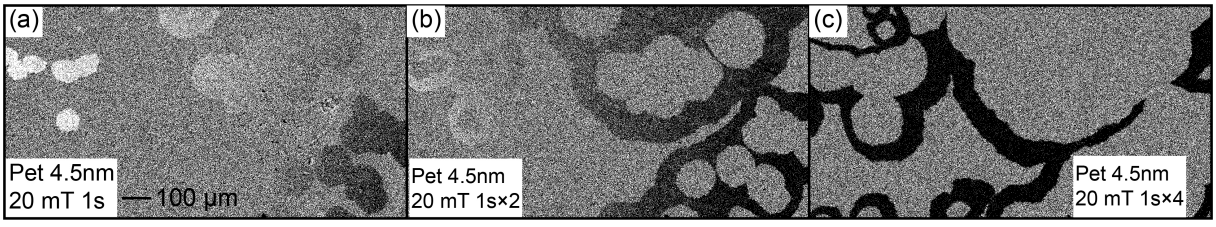

Figure B2 (a) The image of Sub.(Pet)/Ta(3)/Pt(4.5)/Co(1)/Pt(3) stacks under the field of 20mT after the field pulse of 1s. (b) Under the condition of (a), one field pulses of 1 s were applied. (c) Under the condition of (a), 3 field pulses of 1 s were applied.

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