

# Ultra-high spatial resolution magnetic imaging of oxide surfaces and interfaces by the development of laser-PEEM

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We developed the high spatial resolution of a photoemission electron microscope (PEEM) with a continuous wave deep ultraviolet laser[1]. Threshold photoemission is sensitive to the chemical and magnetic structures of the surface of materials. The spatial resolution of PEEM is limited by space charging in use of pulsed photon sources as well as aberrations in the electron optics. We achieved the resolution around 2.6 nm. This is the highest resolution of the world as the PEEM.

We would like to report the ferromagnetic domain structures of SrTiO<sub>3</sub> perovskite oxide surface and interfaces of LaAlO<sub>3</sub>/SrTiO<sub>3</sub>. In SrTiO<sub>3</sub> surface, we found the perpendicular magnetic domain with its size of 30-40 nm and the ferromagnetic transition temperature is around 900K [2]. We will also report the photo-induced ferromagnetism on the surface of Sc-doped SrTiO<sub>3</sub>.

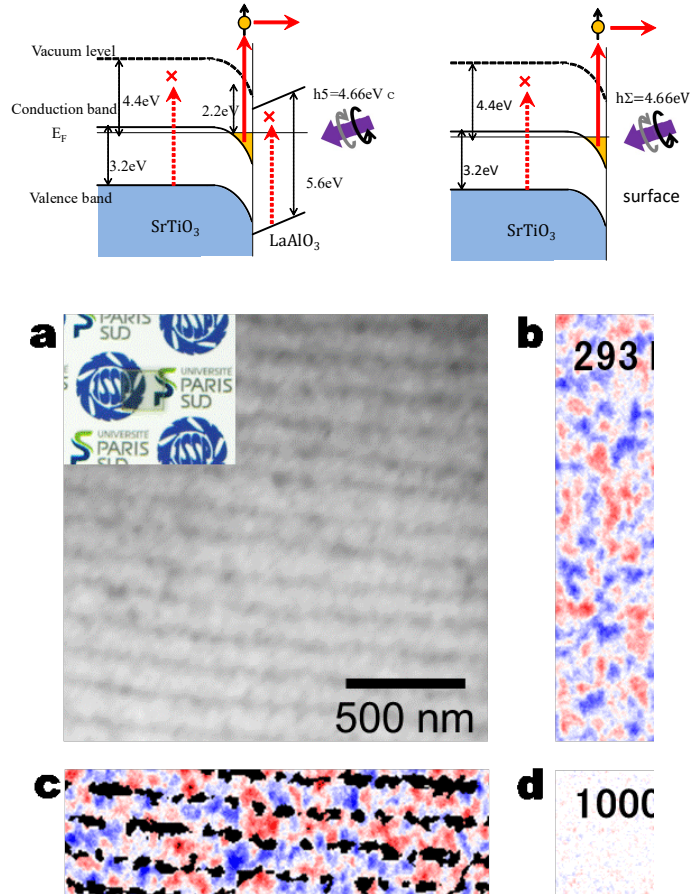


Fig.1 Ferromagnetic domain structures of SrTiO<sub>3</sub> surface [2]

[1] T.Taniuchi, Y.Kotani, S.Shin, Rev. Sci. Instrum.**86**, 023701 (2015).

[2] T.Taniuchi, Y.Motoyui, K.Morozumi, T.C.Rödel, F.Fortuna, A.F.Santander-Syro, S. Shin, Nature Commun.**7**, 11781(2016).