

Poster Presentation

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Surface sensitivity of total reflection high-energy positron diffraction

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Reflection high-energy positron diffraction (RHEPD) is the positron counterpart of reflection high-energy electron diffraction (RHEED). RHEPD was proposed in 1992 [1], and first demonstrated in 1998 [2]. Unlike the case of the electron, the potential energy of the positron inside a crystal is positive, and hence positrons incident on a crystal surface with a glancing angle smaller than a certain critical angle are totally reflected. This feature makes the positrons a tool extremely sensitive to the topmost layer of the crystal surface. Recent development of a brightness-enhanced intense positron beam at KEK [K. Wada, et al., J. Phys.: Conf. Ser. 443, 012082 (2013)] has made it possible to obtain clear RHEPD patterns. We rename the technique with a refined beam as "total reflection high-energy positron diffraction (TRHEPD)". Here we demonstrate that the TRHEPD pattern from the Si(111)-7x7 DAS surface taken with a glancing angle smaller than the critical angle for the total reflection is essentially determined only by the atoms exposed on the surface (adatoms and the atoms in the first surface layer) [3]. The technical details of the positron beam preparation [M. Maekawa, et al., to be published in Eur. Phys. J. D (2014)], results on the Pt/Ge(001) nano-wire surface [I. Mochizuki, et al., Phys. Rev. B 85, 245438 (2012)], TiO₂(110)-1x2 surface, and silicene on Ag(111) surface [Y. Fukaya, et al., Phys. Rev. B 88 205413 (2013)] are also presented in this conference.

[1] A. Ichimiya, *Solid State Phenom.* 28/29, 143 (1992)., [2] A. Kawasuso, and S. Okada, *Phys. Rev. Lett.* 81, 2695 (1998)., [3] Y. Fukaya, M. Maekawa, et al., to be published in *Appl. Phys. Express* (2014).

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