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$SrRuO_3$ Valence Band study by means of Resonant Photoelectron Spectroscopy

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Thin epitaxial $SrRuO_3$ films were studied by means of resonant photoelectron spectroscopy using UV synchrotron radiation in the energy range 37 – 81 eV. Obtained spectra show evident Fano behavior [1,2], however cannot be successfully fitted with only one Fano resonance in whole binding energy (BE) range. According to the resonance energy E_R, width w and asymmetry parameter q valence band may be divided into two BE regions with actually constant, but strongly different two parameters sets: $E_R = 51.8 \pm 0.7$ eV, $w = 10.1 \pm 0.4$ eV, $q = 1.14 \pm 0.16$ and $E_R = 5.0 \pm 0.4$ eV, $w = 4.5 \pm 0.6$ eV, $q = 0 \pm 0.05$ for Ru 4d [-0.4..2.3] eV and O 2p [5.0..8.0] eV regions respectively. Figure. 1 illustrate the partial density of states (DOS) from different type of Ru 4d states obtained by fitting measured constant initial state spectra with two Fano resonances and parameters listed above.

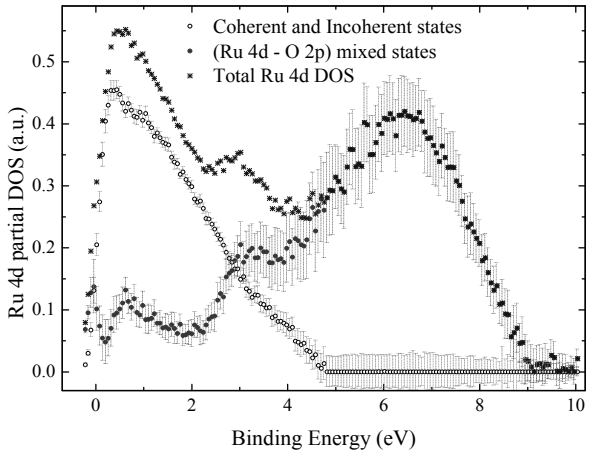

Figure 1. Ru 4d partial DOS. Error bars corresponds to the standard error of fitting.

DOS dominating in Ru 4d region may be attributed to coherent and incoherent states of ruthenium, while dominating in O 2p region to (Ru 4d – O 2p) Ru states in an agreement with theoretical calculations [2,3].

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[1] S. Grebinskij *at al*., *Rad. Phys. Chem.* **B80** (2011) 1140.
[2] S. Grebinskij *at al*., *Phys. Rev.* **B87** (2013) 035106.
[3] E.B. Guedes *at al*., *Phys. Rev.* **86** (2012) 235127.

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Au covered ZnO layers irradiated by femtosecond laser pulses

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We report on the results of structural modifications induced in ZnO by single-shot irradiations with intense femtosecond VUV pulses. The radiation was generated by a free electron laser [1] operating in the wavelength range of 51-60 nm. The studied samples were thin ZnO layers on Si substrate, with and without Au overlay.

The samples were treated according to the irradiation procedure described in [2]. As a result, the sample surface was irradiated in hundreds of spots arranged in rows. The distance between spots was typically approx. 300 μm to avoid possible overlapping of defects induced in neighboring areas [3]. The spot area, depending on fluency, material properties and irradiation geometry, changed from few up to few tens μm^2.

After irradiation, the samples were examined by means of the atomic force microscopy, interference-polarizing microscopy and **c**athodoluminescence. Further structural characterization was done with synchrotron radiation at the DORIS W1.1 beamline in Hasylab with the monochromatic X-ray beam of wavelength 1.54056 Å. The measurements were recorded in a 2θ scan mode in the grazing incidence geometry. The ω-2θ scans were also recorded in order to find the structural changes in the near-surface layers affected by the irradiation.

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[1] T. Shintake, et al., *Nature Photon.* **2** (2008) 555–559.
[2] R. Sobierajski,et al., *J. Instrumen.* **8** (2013) 02010.
[3] W. Wierzchowski, et al., *Radiat. Phys. Chem.* **80** (2011) 1036-1040.