

**SURFACE AND THIN FILM ANALYSIS USING GRAZING
INCIDENCE FAST ATOM DIFFRACTION (GIFAD)**

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Abstract. Grazing collisions at surfaces offer rather contrasted conditions. For well ordered flat surfaces, the scattering is spread among several lattice sites, each of which produces only a tiny elementary deflection. If, in addition, the atomic projectile is aligned along a crystallographic direction, the surface appears as made of parallel furrows which act as a diffraction grating for the atomic wave. We will show that the analysis of characteristic diffraction pattern recorded on the position sensitive detector located downstream allow a sensitive measure of the shape of the surface electronic density. At variance, if a terrace edge or an ad-atom is sitting on the surface along the trajectory, a quasi-binary collision will follow in which energy and momentum conservation allow identification of the mass of the collision partner.

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