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Pushing microbeam probes to nanoscale resolution for the study of buried interfaces

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In this work, a specific preparation procedure is described, for making possible to obtain in one shot structural and compositional characterization of a buried interface at the nanometre scale using a micrometre scale probe. Specific examples based on dispersive micro X-ray absorption spectroscopy, shows that nearly-atomic scale changes in local structure, composition, as well as local disorder are faithfully detected: the reactivity of thin films of NiO and ZnO onto differently oriented Al₂O₃ single crystals can be studied with an unprecedented level of detail. The result obtained allowed us to speculate about the mechanisms and the rate determining step of the interfacial reactions. The approach could in principle be applied to any probe with a micrometric resolution, for example by using micro diffraction. It can be speculated that the simultaneous application of X-ray absorption and diffraction with microbeams to samples prepared as here described would be of great relevance in the study of the structure of buried interfaces.

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