Contribution of EBSD measurements and of SEM *in situ* mechanical testing to the analysis of slip activity in metals

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In metals and alloys, the activity of plasticity in slip systems often governs the elementary process of fatigue crack initiation. To propose new ways to improve the metallurgic microstructure or to introduce metallurgical parameters in predictive models for fatigue life it is necessary to precisely describe the microstructural configurations that promote slip activity and crack initiation.

In this field, the local crystallographic orientation is one of the essential characteristics that must be taken into account. EBSD constitutes a powerful tool to investigate this point, especially in polycrystalline alloys. To precise the first stages of slip activity in relation with the stress-strain level, mechanical testing performed *in situ* in a SEM appear as a well adapted tool too.

The talk will present different studies for which both approaches were successively combined. The examples concern austenitic stainless steels, titanium alloys or nickel based superalloys. It will be focused on the identification of slip systems activated for monotonic tension or fatigue testing conditions. Crystallographic domains that favor plastic activity and damage in slip bands will be discussed as well as the influence of local mechanical parameters like Schmid factor. In situ tensile tests will permit to evaluate the critical shear strain for the different slip systems.