Study of the stress intensity factors in the bulk of the material with synchrotron diffraction

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ABSTRACT. In this work we present the results of a hybrid experimental and analytical approach for estimating the stress intensity factor. It uses the elastic strains within the bulk obtained by synchrotron X-ray diffraction data. The stress intensity factor is calculated using a multi-point over-deterministic method where the number of experimental data points is higher than the number of unknowns describing the elastic field surrounding the crack-tip. The tool is tested on X-ray strain measurements collected on a bainitic steel. In contrast to surface techniques the approach provides insights into the crack tip mechanics deep within the sample.

KEYWORDS: SIF, LEFM, synchrotron X-ray diffraction, Overload, MPOD

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