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# Fine residual stress distribution measurement of steel materials by the SOI pixel detector with synchrotron X-rays

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Residual stress is an important factor to evaluate and control the quality of metal materials for industrial products. The residual stress measurement using X-rays is one of the most effective ways to evaluate residual stress without destruction. In this measurement, a Debye-ring that is formed by diffraction of X-ray beams on the surface of polycrystalline metal is used. The effects of residual stress on crystal structure can be observed by the Debye-ring's deformation. Thus, residual stress can be analyzed from the shape of Debye-ring.
In previous studies, we developed the residual stress measurement system based on the $cos\alpha$ method using the two-dimensional detector. The silicon on insulator (SOI) pixel detector, named INTPIX4, was implemented as this system's two-dimensional detector. In a typical setup in laboratory, this system requires only one second for measuring one specified point. It's drastically faster than a conventional system based on $sin^2\psi$ method that requires more than ten minutes. And it's also faster than the $cos\alpha$ based system using an imaging plate that requires one minute. This feature makes it easier to evaluate the two-dimensional distribution of residual stress in a short time and this will give us more detailed information to evaluate materials. We already tried to measure the two-dimensional distribution at laboratory setup with Cr X-ray tube (Cr K$\alpha$ 5.4 keV) and got some good results. We started to measure with synchrotron monochromatic X-rays to determine the fine accuracy and fine sampling pitch distribution as the next step.
In this presentation, we'll report the result in the first synchrotron's experiment, the residual stress distribution of the standard specimen.

## Submission declaration

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