

Enhancement of product durability and usability for resource-efficient society

Fatigue behavior of composites based on a multiscale structure analysis using synchrotron x-ray diffraction and scattering measurements

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Summary :

We construct a multiscale structural analytical method for various composite materials during cyclic deformation fatigue test using synchrotron X-ray scattering measurement, then clarify a mechanism of fatigue failure of the composite materials.

Synchrotron X-ray scattering method enables us to investigate structure changes of materials at multiscale from sub-nanometer to micrometer range at a single-micrometer scale with quite short exposure time. As the result, structural changes of materials can be solved under various external stimulus. However, fatigue test has not been formed yet due to difficulty of experiments during long fatigue process and complicated fatigue tester and phenomenon itself.

We will investigate changes in crystal structure and crystallite size, and nano to micro-meter scale void and craze structures, and then attain elucidation of the mechanism of fatigue failure of the various commercial composite materials.

