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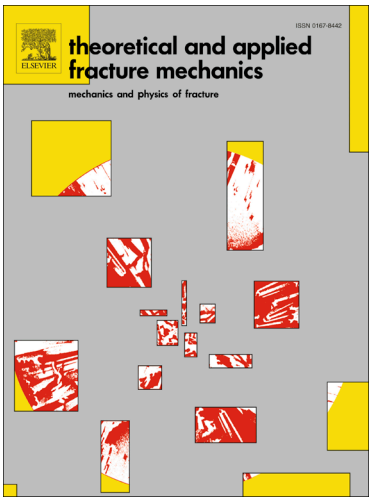

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AN ANALYSIS OF THE SPECIFIC HEAT LOSS AT THE TIP OF SEVERELY NOTCHED STAINLESS STEEL SPECIMENS TO CORRELATE THE FATIGUE STRENGTH

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ABSTRACT

The specific heat loss per cycle (Q parameter) was used in previous works to synthesize more than one hundred experimental fatigue test results generated from plain and bluntly notched specimens made of AISI 304L stainless steel. It was shown that Q can be estimated at a point of a specimen or a component starting from the cooling gradient measured immediately after the fatigue test has been stopped. Since the cooling gradient was measured by means of thermocouple wires attached to the specimen's surface by means of a 1.5-to-2 mm glue dot diameter, notches with tip radii greater than 3 mm were tested, because the glue dot diameter would have been too large to capture the specific heat loss at the tip of sharper notches. In this paper, the cooling gradient has been measured by means of an infrared camera, equipped with proper lens and an extender ring to achieve a 20 μm/pixel spatial resolution; therefore the investigation could be extended for the first time to notch tip radii lower than 3 mm. Fully reversed axial fatigue tests have been carried out on 4-mm-thick, hot-rolled AISI 304L stainless steel specimens. As a result, the new fatigue data have been found to collapse inside the existing heat energy -based scatter band previously calibrated on blunter notches. The heat energy distribution close to the notch tip has also been investigated.

Keywords: energy dissipation, energy methods, AISI 304L, fatigue, notch effect, energy distribution