Development of quick and precise measurement technique for evaluation of fracture resistance of ceramics

Reproducible crack length measurement for the indentation fracture method by visualizing the tips of the cracks

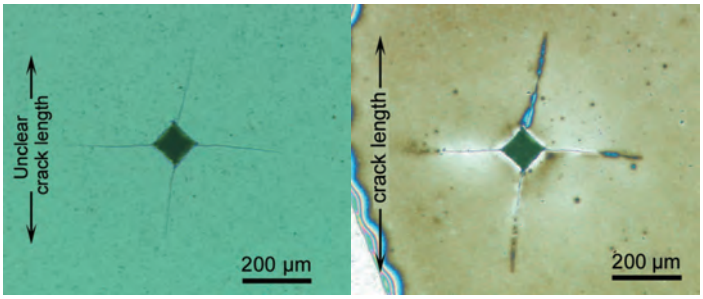
We have developed a noble measurement technique for precise and quick evaluation of fracture resistance of ceramics. In the developed technique, a visualizing solution is applied on the indented surface of ceramic test pieces during fracture resistance testing by the indentation fracture (IF) method. The concentration of a commercially available solution was optimized and the solution was diluted to produce the visualizing solution. This could enhance the contrast of the image of the crack tips, reducing errors in reading crack lengths. Measurements of fracture resistance of ceramics by the IF method will become accurate and reproducible since it uses crack lengths for the calculation. The developed reliable technique enables the qualitative assessment of performance of tiny advanced ceramic products and will contribute to the increase of Japan's global market share of ceramic products.

Hiroyuki MIYAZAKI

Advanced Manufacturing Research Institute

h-miyazaki@aist.go.jp

AIST TODAY Vol.14 No.9 p.12 (2014)



Metallurgical microscope images of an indentation on a surface of ceramic sample
The faint image of crack tips observed with the conventional method (left) became clear and visible enough to measure the crack lengths by the developed method (right).

Development of ultra-compact fluorescence detection module for microfluidic biochemical diagnosis

Key technology enabling rapid near patient diagnosis at home or bedside

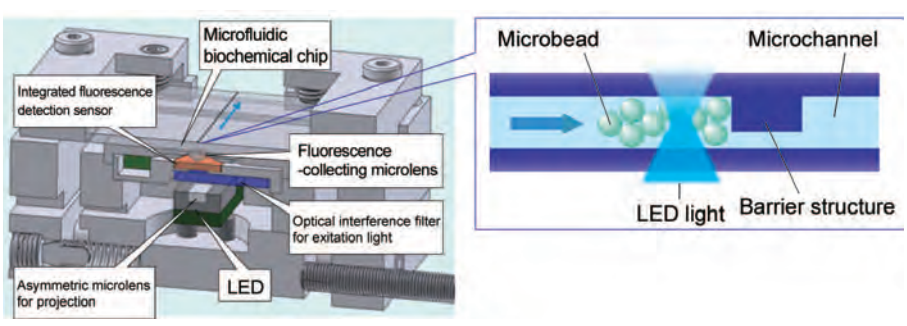
We have developed an ultra-compact fluorescence detection module that coaxially configures an excitation source and a detector. A surface emitting micro LED is used as an excitation source. An optical interference filter is integrated with an a-Si:H photodiode, making a fluorescence detector. Light from the surface emitting LED is focused into a spot smaller than the micro-channel width, using an aspherical micro-lens, achieving low-scattering irradiation onto the microchannel. Furthermore, immunoassays can be carried out by combining the ultra-compact fluorescence detection module with a microfluidic chip that has micro-beads packed and immobilized in a microchannel.

Toshihiro KAMEI

Research Center for Ubiquitous MEMS and Micro Engineering

toshi-kamei@aist.go.jp

AIST TODAY Vol.14 No.9 p.13 (2014)



A structural drawing of an LED-induced fluorescence detection module and a cross-sectional view of a microchannel along its fluidic flow