SEMINAR

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Crack Front Geometry and Stress Intensity Factor of Semi-circular Bend Specimens with Straight Through and Cracked Chevron Notches

Prof. Yuzo OBARA
Kumamoto University, Japan

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VENUE: Meeting room, Center Telč
Batelovská 854, 588 56 Telč

The semi-circular bending (SCB) test is one of the most useful testing methods for determining the mode-I fracture toughness of rocks. A SCB specimen with an artificial notch is loaded at three points including two lower points and a single upper point during the test. In general, there are two types of geometries for artificial notches: straight through and chevron notches. The straight through notch is commonly adopted for the SCB (STNSCB) test as the suggested method for estimating mode-I fracture toughness of rocks in ISRM, while the cracked chevron notch SCB (CCNSCB) test using a specimen with a chevron notch has been performed by some researches. In this presentation, by means of the commercial finite element software ABAQUS, cracking behavior from the tip of an artificial notch during STNSCB and CCNSCB tests is analyzed with Extended Finite Element Method (XFEM) in order to clarify crack front geometry in the process of cracking. The relationship between the crack length and the stress intensity factor can be obtained by analyzing stress intensity factors of the specimen with FEM, based on crack front geometries calculated with XFEM during the cracking process. Using this relationship, the minimum stress intensity factor at a critical crack length is determined for estimating mode-I fracture toughness of the rock for the CCNSCB test. Furthermore, by performing the SCB tests using Kimachi sandstone

specimens with two different artificial notch geometries, fracture toughness of the sandstone is determined from the SCB test. Consequently, it is concluded that the values of fracture toughness from the test with two notch geometries are almost the same.

Yuzo OBARA is professor from Kumamoto University (Japan). He obtained Dr. Eng. in 1986 from Nagoya University. He worked as a research associate in Nagoya University, and moved to Kumamoto University in 1983. Since 1997, he is a Professor in the Graduate school of Science and Technology, Kumamoto University. He was the co-chairman of 2nd and 3rd International Symposium on Rock Stress and International workshop of X-ray CT for geomaterials held at Kumamoto City, Japan. He was the head of GeoX CT center in Kumamoto University, and also a Vice-Dean of Faculty of Engineering from 2011 to 2013 and 2016 to 2018.

Organizers

Ing. Leona Vavro, Ph.D., ÚGN AV ČR, email: leona.vavro@ugn.cas.cz
doc. Ing. Daniel Kytýř, Ph.D., ÚTAM AV ČR, IMEKO TC15, email: kytyr@itam.cas.cz