Experimental measuring and characterizing of the original tensile-fracture and its behaviors in the crude bedrock

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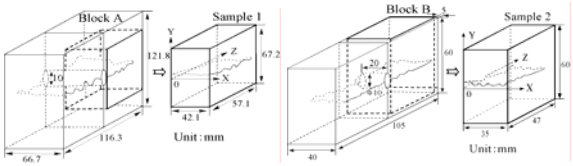
Tensile fractures originated and extended from a borehole drilled at the center of a rock block (Figure) are important to study solute transport in fractured media. In order to clarify the form of fracture at original condition, samples were prepared only from the rock blocks within which tip of the tensile fracture extended from borehole ended. Then, photograph of sample across the section having fracture profiles were taken from where fracture generated as well as disappeared, with fracture surfaces in original condition. Based on the photographs, coordinate values of upper and lower boundaries of fracture profiles were measured at a regular interval. Moreover, the fracture behaviors including fracture aperture, fracture angle, and closing direction of fracture surfaces were estimated and described using the fractal geometry. Results can be summarized as follows:



The fracture angle of the fracture surfaces tended to gradually decrease from the wall of borehole to the front-end of fracture. This result reveals that both of the upper and lower fracture surfaces approach to the fracture front-end along the approximate directions.

The linear and radial modes of the fracture propagation were drawn from the distribution vectors showing the closing directions of the fracture surfaces. The two models are similar in structure to a tree spreading out its branches. Such a structure can be assumed to be very closely related to the fractal behaviors of roughness evaluated by fracture profiles.

The width of fracture aperture decreased with the distance away from the wall of borehole. The decreasing direction harmonized well with that of the fracture propagation. The macroscopic distribution of apertures can be concluded to be strongly associated with the intrinsic tensile stress prior to the occurrence of fractures distributed in the sampled rock.

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Matrix effect of soil for determination monocyclic aromatic hydrocarbons by headspace-GC-MS

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Method and Data

EPA analytical method 5021 [1] introduces the extract and analytical procedures for volatile compounds in soil by headspace-GC -MS. Ratio of liquid and gas in headspace vial is one of key parameters to affect headspace analysis [2]. Based on standpoint of silicon dioxide with very weak adsorption ability for target contaminants, silicon dioxide is added to calibration standards to modify the difference. What would happen if soil is added to calibration standards for making calibrate curve?

compounds	H_2O	SiO_2 + H_2O	GSS-13soil + H_2O
benzene	1.0000	0.9898	1.0129
toluene	1.0000	0.9866	0.9833
ethylbenzene	1.0000	0.9845	0.9669
O-xylene	1.0000	0.9740	0.9776
isopropylbenzene	1.0000	0.9742	0.9630
chlorobenzene	1.0000	0.9808	0.9568
1,3-dichlorobenzene	1.0000	0.9586	0.8723
1,2,3-trichlorobenzene	1.0000	0.9179	0.7932

Table 1: Relative slope of calibration curve for different matrix

Discussion of Results

Based on the comparison of slope in different matrix, data show that quantity result of soil samples depends on matrix of calibration samples. In fact, it is difficult to predict the differentia of water, silicon dioxide and real soil because of soil matrix complexity for a specific compound. The accuracy is noticeable to quantity the soil samples by using solution with silicon dioxide whether or not. Developing of representative reference soil or spiking reference material solution in real sample to quantity analyze may be a good idea.

[1] US EPA method 5012 (1996) 9-13. [2] Serrano & Gallego (2006) *J. of Chromato*. **1118**, 261-270.