Fundamental study of flush fracturing of high temperature controlled by depressure rate

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Generating cracks to rock can be applied to deep drilling technology for seated geothermal development. Thermal stress derived from rapid decompression is considered to be effective for crack generation of rocks. But possible bottomehole decompression condition is milder than that of previous studies. In this study, rapid decompression experiment at 500, 550 and 600 ℃ for granite samples with water/rock ratio of 2.5, 0.5 and 0.2 was conducted. And after experiment porosity and P-wave velocity (V_p) were measured. As temperature and water/rock ratio increase, the temperature after decompression was decreased (ΔT as temperature difference of before/after decompression was increase.). Porosity is largely depending on temperature before decompression, in particular a-b phase transition of quartz has large influence. V_p is also depends on temperature before decompression. And V_p of sample at 600 ℃ decompression has same as water. Differences of water-saturated V_p and dry condition V_p shows the relationship of ΔT. Therefore ΔT affects the process of crack generation. When ΔT is small, micro crack is generated, and when ΔT is large, large aperture crack is generated. Elastic moduli were calculated from porosity and V_p. Young's modulus decreases as porosity increases and shows negative value in all after decompression samples, which indicates samples after decompression are no more elastic. This result shows that it is possible to generate small cracks to rock even if ΔT is small.

