

Physical structure in pillars of granite porphyry surrounded by columnar joints

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Columnar joints are developed in granite porphyry of the Miocene Kumano Acidic Rocks in the Kii peninsula, Japan. We conducted a hammer rebound test on polygonal surfaces normal to the columnar joint axis, measured physical properties (bulk density, porosity, P-wave velocities and X-CT value) and analyzed mineralogy. We found that those columns have a concentric structure around the longitudinal axis of a column. (1) The central portion of a column has porosities 1% higher than those of the other portions, while the margin of the column has more number of large pores. (2) The two parts have lower rebound value and slower P-wave velocity in the direction of the columnar axis than the intermediate part does. P-wave velocity was the fastest in that direction. (3) The ratio of smectite and chlorite was larger near the margin than the other portions. These results suggest that the structure shown by the physical properties in a column of granite porphyry is related to vesiculation of melt and also affected by following hydrothermal alternation.

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