

## Dependence of water concentration distribution of columnar joints formation in analogue experiments

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Columnar joints of igneous rocks and ignimbrites have various morphological patterns. As their unit structure, column structure can be classified in terms of straight or curved. Columnar joint is formed by volume contraction due to cooling and tensile stress accumulated inner the volume is released as sequentially cracks according to the temperature gradient during cooling. Basic research to explain how curved columns are formed has not been conducted. In this study, we report the results of reproducing curved structure in analogue experiments by drying starch and water mixture. We put the mixture into a cylindrical container and light a lamp (60W) 1.5cm above the surface of mixture. We take images with X-ray CT of the specimen before drying perfectly and observe the spatial distribution of water concentration of the mixture on the way to form columnar joints. As a result, we recognize that water concentration distribution at a depth in mixture increases with the horizontal distance from just below the lamp. The direction of crack developing from the surface of the mixture to inner is almost perpendicular to the contour of water concentration. We confirm that the effect of heat from the lamp on the surface of the mixture differs with the distance from the lamp and it suggests inhomogeneous water concentration in mixture is caused by the difference of drying rate depending on the distance from the lamp. We also report the relationship between the direction of crack advance and the change of water concentration distribution with time.

Keywords: columnar joint, analogue experiment, crack formation, Micro-focus X-ray CT, concentration distribution