Mem. Fac. Educ., Shimane Univ. Vol. 3, pp. 71=73, February, 1970.

PETROLOGICAL SIGNIFICANCE OF THE PITCESTONE XENOLITH INCLUDED IN PLAGIOLIPARITE FROM OTOSHI DISTRICT, SHIMANE PREFECTURE, JAPAN

By

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I. Introduction

Pitchstones are found as xenoliths in the plagioliparite from Otoshi district. Althouth these are weathered to montmorillonite clay in many outcrops, the fresh rocks studied were corrected with difficulty.

In this paper the author wishes to express on the petrological significance of the pitchstone xenolith included in plagioliparite.

II. Descriptions

Pitchstone xenoliths are found included in plagioliparite of Otoshi, about 37 Km to the west of Matsue city, Shimane prefecture, as shown Fig. 1.

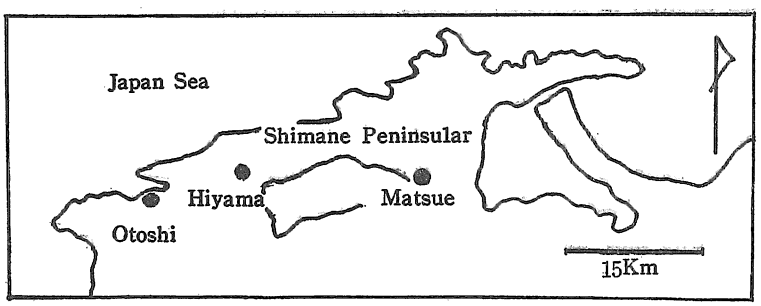

Fig. 1. Localities of pitchstone xenolith and pitchstone.

Plagioliparite of Otoshi district is the acidic menber of the Omori formation belonging to the San-in Neogene Tertiary. The same kind of plagioliparite connected to pitchstone were described by present writer(1968). The plagioliparite consists of phenocrysts of plagioclase, hornblende, and a little pyroxene, which sometimes altered to chlorite, and groundmass feldspar, iron ore, and glassy materials.

The size of pitchstone xenoliths ranges from about 20 centimeters to several meters in diameter, and their shapes are irregular form to rounded form. They are dull, pitchy luster glassy rocks, being largely composed of glassy groundmass. Long green prismatic microlites of pyroxene visible only under the microscope are included in glassy groundmass, Except for some samples, these xenoliths shows usually porphyritic

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texture composed of the phenocrysts of plagioclase and opaque minerals embedded in glassy groundmass. The chemical analyses of pitchstone xenolith are given in Table 1.

Table 1. Chemical compositions of the pitchstones and comparable rocks from the Shimane peninsular district.

	(1)	(2)	(3)	(4)	(5)
SiO_2	69.21	77.01	69.08	74.54	78.49
TiO_2	0.34	0.38	0.17	0.37	0.19
Al_2O_3	12.92	11.75	11.09	13.90	12.60
Fe_2O_3	1.29	1.26	0.58	1.38	0.66
FeO	1.32	0.60	0.82	1.42	0.93
MnO	0.20	0.14	0.04	0.22	0.05
MgO	1.31	0.41	0.55	1.41	0.63
CaO	3.73	1.39	3.16	4.01	3.59
Na_2O	2.33	4.76	2.03	2.51	2.31
K_2O	0.12	0.28	0.44	0.13	0.50
P_2O_5	0.10	0.05	0.04	0.11	0.05
$H_2O(+)$	7.02	1.09	6.77		
$H_2O(-)$	0.55	0.18	5.23		
Total	100.50	99.29	100.00	100.00	100.00

(1). Pitchstone xenolith included in plagioliparite from Otoshi district.
(2). Plagioliparite from Otoshi district. (Host rock).
(3). Pitchstone from Hiyama district closely related to plagioliparite volcanostratigraphically.
(4). Pitchstone xenolith recalculated to 100%, free of volatiles.
(5). Pitchstone from Hiyama district recalculated to 100%, free of volatiles.

And also, some analyses of the pitchstones and plagioliparite of cognate origin of the Omori formation of Shimane peninsular district are arranged in same Table.

X-ray powder patterns of the pitchstone xenolith were taken with the specimen analysed chemically. These results are shown in Fig. 2.

X-ray data shows that the present pitchstone xenolith are conspicuously altered to zeolite mordenite and slightly altered to montmorillonite.

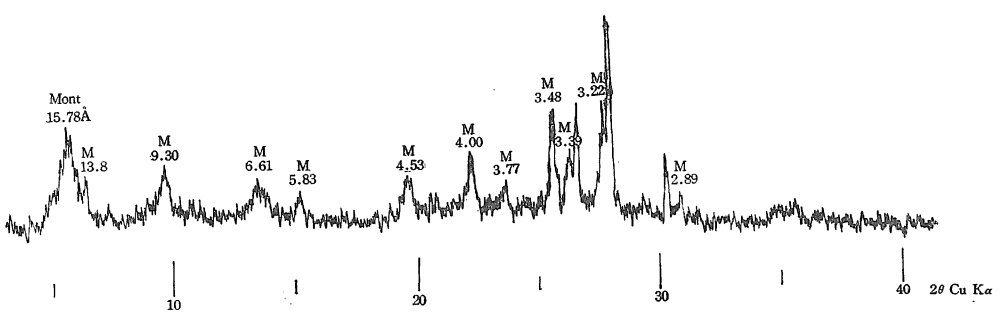

Fig. 2. X-ray powder pattern of pitchstone xenolith included in plagioliparite from Otoshi district, Shimane peninsular.
M : Mordenite Mont : Montmorillonite

III. Discussions

The two most commonly accepted thought of the origin of pitchstone xenoliths in plagioliparite. are : 1) cognate xenolith derived from early solidified rock, and 2) xenolith of rock surrounding the magma chamber and wall of conduits.

A cognated origin of the pitchstone xenolith in plagioliparite is supported by the following facts : (1) the chemical analyses of the pitchstone xenolith and the host rock closely resemble each other except volatile components, (2) as discussed by present writer (1968), the pitchstone and plagioliparite of the Omori formation of Shimane peninsulr district are closely related on the field occurrence and chemical composition.

From all these data, present writer is of opinion that the rock of pitchstone are rapid cooling material of the acidic magma rich in water at relatively low temperature hydrothermal conditions at the shallow depth under the ground.

If the rock mantle surrounding the magma and walls of conduits were impervious to water vapour, excess water dissolved in acidic magma would isolate as small globules in high viscous glassy magma until an equilibrium between the gas and liquid phase attained. Hardly had the perlitic curving cracks tend to seal up such open spaces. These excess water have reacted with solidifing glassy materials, and mordenite were formed in this way.

After a part of acidic rising magma has frozen as pitchstones, the cognate liquid magma below continue to rise, subjecting the consolidated part of the magma to systematic stresses.

Thus a liquid magma could rise through a frozen pitchstones of the resemble chemical compositions and then caught the pitchstones as a xenolith.

Reference

MIURA, K. (1968), Some notes on the pitchstones from the Shimane peninsular district, Shimane prefecture, Japan. *Mem. Fac. Educ. Shimane Unive.*, 2, 50-57.