Xenoliths of young pyroxenites from Takashima, the Southwest Japan arc, as deep-seated cumulates from adakitic melt

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Introduction

Slab-derived silica-rich melts can erupt on the surface, suggesting a survival of silica-oversaturated character even after they pass through olivine-rich mantle wedge. We have so few data, however, to directly show the behavior of the silica-oversaturated melts within the mantle wedge. We have been working on peridotite xenoliths and other rocks derived from mantle wedge to explore the mantle-wedge materials and processes. We found orthopyroxene-rich rocks replacing olivine in dunite/wehrlite of Group I (Frey & Prinz, 1978) in alkali basalt from Takashima, the Southwest Japan arc. Petrological investigation revealed that they are deep-seated cumulates from an adakitic melt.

Geological setting and petrography

Takashima Island is located at Karatsu Bay of northern Kyushu. Alkali olivine basalt of Takashima is very famous for containing numerous ultramafic and related xenoliths. They are mainly dunite, wehrlite, clinopyroxenites, websterites of Group I and pyroxenites of Group II. Relatively fine-grained orthopyroxenites (Group III of Arai & Kobayashi, 1981) are frequently found in Group I dunite and werlite. The former cut the latter as a veinlet, or the former occasionally form discrete xenoliths enclosing fragments of the latter. Plagioclase is often present at the center of the veilent. To be important, opx shows a replacement texture: olivine has ragged grain boundaries with opx, suggesting a replacement of olivine with opx. Chromian spinel in adjacent dunite/wehrlite has fringe of opx.

Mineral chemistry

The opx and cpx in the veinlet are characteristically high in Al_2O_3, around 5 wt% 5-8 wt%, respecitively. Mg# of opx ranges from 0.82 to 0.88. The cpx contains 11.3 ppm of La, 33.9 ppm of Nd, 3.38 ppm of Yb and 119 ppm of Sr (determined with SIMS at Tokyo Inst, Technology). This chemical signature of cpx is very similar to that in primitive adakite from the Aleutians (Yogodzinski & Kelemen, 1998). Combined with the possible silica-oversturated character of the melt responsible for formation of the pyroxenites, the melt is adakitic. Slab melting was possible during the opening of back-arc basin when hot mantle plume impacted the eastern margin of the Eurasian continent (then Japan arcs).

Search for chemotaxonomic markers in Neogene plant fossils from Tokai Group, Japan

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Introduction

Plant fossil chemotaxonomy can provide useful information for reconstructing paleobotanical and paleoenviromental aspects. Chemical degradation products from macromolecules in Neogene plant fossils were investigated to search for chemotaxonomical markers and to examin their potentials as markers of paleo-vegitation.

Materials and Methods

An achene fossil of *Liquidambar formosana* and two pinecone fossils of *Pinus triforia* and *Pinus fujiii* were treated by chemical degradation as hydrolysis with KOH/MeOH and BF_3 - Et_2O complex. The degradation products were fractionated by silica gel column chromatography, and analyzed by GC and GC-MS.

Result and Discussion

Fatty acids characterized by higher even carbon number predominance (CPI>4.3) were major hydrolysis products in all the samples, showing low maturity level. Lignin phenols were also detected commonly in all the samples. Syringic compounds which characterize angiosperm were detected only in *L. formosana* hydrolyzate. Vanilic compounds generally detected in hydrolyzates of both angiosperm and gymnosperm were identified in all the samples. Oleanoic triterpenoids and diterpenoids (Fig. 1) are major terpenoids detected in hydrolyzates of plant fossils. Oleanoic triterpenoid was identified only in *L. formosana* hydrolyzate. *P. triforia* and *P. fujiii* are characterized by isopimara- 8(14), 15 –dien– 18 -oic acid and isopimaran-18-oic acid. Whereas, dehydroabietanoic acid and abieta- 6, 8, 11, 13 - tetraenoic acid were identified only in *P. triforia.* These biomarkers can be peculiar chemotaxonomic markers of higher plant species investigated in the present study.

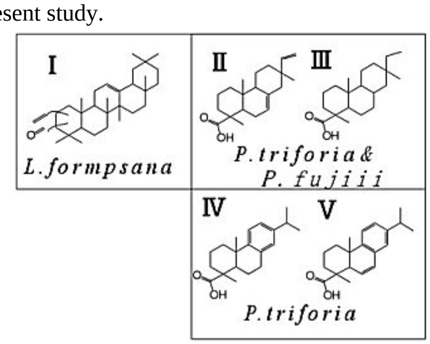

Fig. 1 Bound terpenoids from some Neogene plant fossils.