Intrusive breccia related to the alkaline-carbonatitic association of NW Fuerteventura (Canary Islands, Spain): a remnant of deep-seated parts of diatremes?

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The island of Fuerteventura, in the eastern part of the Canary archipelago (Central Atlantic) is one of the few geological sites worldwide for oceanic carbonatites and related alkaline silicate rocks. This alkaline-carbonatitic association (ACA) represents the first magmatism occurring in the island, at 25-23 Ma (Munoz et al., 2005 and references therein) and comprises: perovskite-clinopyroxenite, ijolite, nepheline-syenite and calciocarbonatite (Munoz et al., 2003; de Ignacio, 2008). There is evidence that these intrusive rocks had their volcanic equivalents (Munoz et al., 2002), though the remnants of the latter are scarce in the island. In this work, small outcrops of intrusive breccias showing gradational relations to nepheline-syenites and ijolites in northwest Fuerteventura are described. These breccias are clast-supported, showing 3 to 5 cm long, subangular to subrounded, syenitic fragments (composed of K-feldspar and albite) and, 0.3 to 0.5 mm long, ijolitic fragments (composed of oxides, apatite and titanite). The matrix is formed by abundant, minute crystals of K-feldspar, albite, iron oxides, mica, apatite, and occasionally zircon, reflecting comminution of the syenitic and ijolitic country rock. Mineral chemistry of both the fragments and matrix compares well with composition intervals defined by de Ignacio (2008) for each mineral phase in the host rock nepheline-syenite and ijolite. The syenitic fragments contain K-feldspar (Or75-80) with 1-2 wt% BaO, a composition which falls inside the range for K-feldspar in nepheline-syenites (Or72-88). When it is fresh, mica forming part of the matrix is Phl75, with 2 wt% TiO2, which falls inside the range for mica in the ijolites (Phl80-74). The small opaque fragments in the breccias comprise several types: 1) 1-4 mm oxide crystals associated with apatite aggregates; 2) 0.2 mm long, anhedral titanite enclosed by 0.8 mm long oxides and 3) 0.4 or less mm long, subangular, elongated oxide crystals marking, together with mica, a crude flow texture in the matrix. The first and third type of oxides are almost pure magnetite (Mt98-91 Usp2-9) with 3-5 wt% TiO2, resembling oxides of ijolites (Mt92-94 Usp6-8), though the matrix ones are more altered (low analytical sums). The second type of oxides, surrounding titanite, are anatase (TiO2) and an intermediate product between ilmenite and anatase. These oxides are the transformation products of perovskite, which is abundant both in clinopyroxenites and ijolites (de Ignacio, 2008). Considering their field, textural and mineral chemistry features, it is proposed that these breccias could represent the subvolcanic part of diatremes that once connected the ACA intrusives with volcanic edifices currently dismantled. No fragment of carbonatite has been observed in them and therefore, we propose that the propelling agent for fragmentation of ijolite and nepheline-syenite would have been CO2 related to carbonatite magmas belonging to this rock association.