

## **Sadiman volcano, Crater Highlands, Tanzania: does it really contain melilitites and carbonatites or it is just a phonolite-nephelinite volcano?**

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Sadiman is 4.8-4.0 Ma old volcano located in the Crater Highlands area in northern Tanzania [1, 2]. Limited published data [2-4] and field observations show that it consists of interlayered phonolitic tuffs and nephelinitic lavas. Rare xenoliths of phonolite and ijolite were observed in the nephelinites. It was suggested that Sadiman volcano contains melilititic and carbonatitic rocks [5]. These also occur as tuffs in the Laetoli area where fossilised footprints from human ancestors are known [6, 7] which is why Sadiman is of special interest as a possible source of them.

We found that nephelinites range from phenocryst-poor to phenocryst-rich rocks; the latter seem to be cumulates. Nepheline and diopside are the principal phenocryst minerals; rarely observed are shorlomite, perovskite or wollastonite. Microphenocrysts and groundmass consist of diopside, nepheline, sanidine, titanite, sodalite and apatite in various proportions. Perovskite also occurs as corroded relicts in titanite crystals. Aenigmatite (in groundmass and as a reaction rim on titanite), magnetite, and pyrrhotite are accessory minerals. Nephelinites are low-magnesium rocks (Mg# = 0.17-0.26) with a peralkaline index ranging between 0.88 and 1.21. On a volatile-free basis these rocks contain 46.3-52.6 wt% SiO<sub>2</sub> and 10.5-15.9 wt% Na<sub>2</sub>O+K<sub>2</sub>O. Mineralogical and geochemical data suggest that they are highly evolved phonolitic nephelinites.

Phonolites are phenocryst-rich rocks with anorthoclase and nepheline being the principal minerals. Diopside and titanite are minor phases.

Tuffs contain sanidine as a major mineral, as well as highly altered nepheline and diopside. Heavy mineral concentrates from tuffs are enriched in euhedral perovskite crystals.

No evidence was found for the presence of melilite or primary calcite in any of the samples studied. Also, minerals which can be considered as indicators of carbonatitic activity, and known e.g. from the close Kerimasi carbonatitic volcano (nyerereite, pyrochlore or baddeleyite [8]), have not been found at Sadiman. Only secondary calcite, formed during low-temperature (?) alteration of tuffs, occurs as isolated anhedral crystals and forms veinlets.

All available data do not currently support the occurrence of melilitites and carbonatites at Sadiman volcano.

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