

Geochemistry of the Baixo Alentejo Flysch Group, South Portuguese Zone: Implications for provenance and palaeoweathering

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The Baixo Alentejo Flysch Group (BAFG) is one of the domains of the South Portuguese Zone, consisting of deep-water turbiditic sediments, with more than 5 km in thickness. Stratigraphically the BAFG is subdivided into three formations, from the bottom to the top: Mértola Formation, Mira Formation and Brejeira Formation, with ages ranging from Middle to Upper Carboniferous.

Shales and greywackes of the BAFG Group have been subjected to a detailed petrographic study, and analyzed for major element, trace element, and rare earth element compositions. Greywackes of the three formations show broad range of variation in their SiO₂/Al₂O₃, K₂O/Al₂O₃, Na₂O/K₂O and Fe/Ti ratios, reflecting the mineralogical diversity of these rocks. The average compositional variability index of shales <1 suggests compositional maturity of these rocks. The chemical index of alteration for greywackes and associated shales reveals moderate to intense weathering of the source area.

The samples from the Mira and Brejeira formations have similar trace element abundances, fractionated REE patterns and negative Eu anomaly. All these samples have Th/Sc ratios >0.5, and project similar weathering trends on A-CN-K ternary diagram. Collectively, these data indicate derivation from a felsic igneous (or meta-igneous) source. Similarly, geochemical characteristics of the Mértola Fm. shales are compatible with a predominantly felsic source area. In contrast, greywackes from the Mértola Fm. show variable Th/Sc (0.4-1) and La_n/Sm_n ratios, and Eu/Eu* anomaly (0.65-1.02). They also project into different weathering trends on an A-CN-K ternary diagram, suggesting contrasting mafic and felsic provenance areas for these rocks.

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Preliminary Ar-Ar studies of lunar basaltic meteorite Dhofar 287-A

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The recent increase of the lunar meteorite collection has been complementing our previous knowledge based on Apollo and Luna mission samples. Presently, there are 10 mare basalts available for study found both in cold and hot deserts. Despite the fact that a source on the lunar surface is not known, these meteorites have still provided us with important information on the chemical composition variation within each lunar mare. This is the case of the coarse grained, low-Ti basalt Dhofar 287-A which consists mainly of phenocrysts of olivine and pyroxene set in a fine-grained matrix composed of elongated radiating pyroxene and plagioclase crystals (converted to maskelynite) [1]. The olivine and pyroxene crystals show the existence of abundant cracks and pervasive impact melt veins [1] together with maskelynite these features suggest a shock stage 2b (~28-34 GPa) [3]. Another conspicuous feature of this rock is the large number of late-stage mesostasis composed mainly of fayalite, Si-K-Ba-rich glass, fluorapatite, and whitlockite [1]. Isotopic dating [4] suggest that the Rb-Sr system has been affected by desert weathering and thus no age was obtained. However, the Sm-Nd system appears unaffected and a crystallisation age of 3.46±0.03 Ga was determined. Besides crystallisation age, it is also intended to extract the timing of later events undergone by this meteorite. In the present study we report the initial results obtained for bulk rock analyses using the infra-red laser technique of the Ar-Ar dating method. The age spectrum suggests that the Ar release is affected by ³⁹Ar-recoil likely due to the fine grained matrix of the basalt. This may result from the small size of the sample (1.73 mg) analysed which may have not included any phenocrysts and thus only fine-grained matrix was analysed. The calculated total age of 3.142±0.010 Ga is obtained, corresponding to an initial trapped ⁴⁰Ar/³⁶Ar = ~0. This age suggests that the Ar-Ar system has been disturbed likely by a thermal event such as an impact. The ³⁸Ar/³⁷Ar suggests the existence of Cl-derived ³⁸Ar at the first two heating steps (e.g. terrestrial contamination). The remainder of the steps indicates mixing between trapped and cosmogenic argon corresponding to a CRE-age of 4.8 Ma. Further work in a larger sample will be also presented at the meeting.

[1] Anand *et al.* (2003) *MAPS* **38**, 485-499 [2] Stöfler & Grieve (2007) *Impactites*, in D. Fettes and J. Desmons (eds), Cambridge Univ. Press, UK, 82-92. [3] Shih *et al.* (2002) *LPSC XXXIII*, abst.# 1344.