A 'SPEEDY' K-AR ROUTINE APPLIED TO MG-SIZED BULK ROCKS AND ITS POTENTIAL FOR OIL-GAS INDUSTRY

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The development of new, fast, and easily applicable methodologies is of upmost importance to the progress of science. In the industry, the cost of analyses is always to be considered, even when more established and precise measurements are available at a higher cost. Thus, low-cost techniques might offset others by their cost-benefits ratio, and their applicability can sometimes have a greater impact than high-precision (and therefore high-cost) analyses. In that regard, we developed a quick and low-cost technique of K-Ar dating that neither requires lengthy sample preparations, nor expensive analytical routines, allowing for a speedy geochronological assessment of hundreds of samples, in just a few weeks. The unspiked K-Ar method has been available since the late 70's following the development of the "Cassignol Technique" and has been applied with great success mainly to near-zero age samples from the early 80's onward. However, its applicability on older samples has always been impaired by its primary concept. If no ^{38}Ar tracer (spike) is diluted during the sample degassing, another procedure must be employed to ensure the reliability of the ages. In the unspiked K-Ar technique, this is accomplished by analyzing and comparing the intensity of the ^{40}Ar signal of the unknown sample with that of an atmospheric ^{40}Ar reference (the air pipette), hence why it has been applied to recent-age samples, since their contaminants should have the same Ar-isotope composition of the modern atmosphere. Still, the use of this technique was attempted on Mesozoic mafic dikes pertaining to the Equatorial Atlantic Magmatic Province (EQUAMP) and the Central Atlantic Magmatic Province (CAMP) with fair success, producing ages that, for the most part, corroborated available conventional (spiked) K-Ar and ^{40}Ar/^{39}Ar ages of the same igneous events, on neighboring locations. The main difficulties on these analyzes were related to coarse-grain samples that sometimes produced widely non-concordant results because of the small mg-size fragments selected, which did not properly represent the whole-rock composition. Despite the drawbacks intrinsic to the K-Ar method, like possible misestimation of K contents (regardless of which methodology is employed), and undesirable effect of sample inhomogeneity due to our choice of working with mg-sized aliquots (to allow a quick analytical routine on a modern ^{40}Ar/^{39}Ar equipment, using laser heating), the results were satisfactory in allowing a good age assessment on ca. 1,000km of diabase dike intrusions. Therefore, the unspiked K-Ar technique showed an outstanding potential to produce date estimates notably for aphyric rocks, where the crystal size disadvantages have a lesser impact. This technique was capable of producing over a hundred dates within the analytical timespan of a month, with analytical precision in the order of 5-10% (1-sigma) errors, which is enough to resolve many geological problems. Particularly in the gas and oil industry, the small sample quantities available (from drilling) and the lack of dependency on high-precision dates for characterizing magmatic events makes this methodology useful for assessing the impact of igneous rocks on sedimentary basins that, normally, crystallize as fine-grained mafic rocks and frequently impact the hydrocarbon generation, maturation and/or migration.

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