Testing the Carboniferous Fire Clay tonstein as a sanidine ⁴⁰Ar/³⁹Ar standard

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A central goal of the EARTHTIME initiative is to create an accurate and precise sequence of geological events that can be used to evaluate the rates of processes. For this purpose, the Ar-Ar and U-Pb communities are in need of better standards for inter-laboratory and inter-technique comparisons. At present there is no Paleozoic age sanidine monitor standard for Ar-Ar dating. We suggest that the Carboniferous Fire Clay Tonstein is a good prospect to fill this gap. It also holds promise as a U-Pb zircon standard.

The Fire Clay kaolinitic tonstein is 5-20 cm thick and interpret as an ash layer deposited within the Fire Clay (and equivalent) coal bed(s) of the central Appalachian Basin. Analytically indistinguishable ages reported in [1], of bulk separates distributed over ~300 km transect prompted the single crystal test reported here.

Sanidine crystals (250-350 μ m) from this tonstein, (sample RH1; ~1 km from sample RH of [1]) yield a single crystal 40 Ar/³⁹Ar age of 313.83 \pm 0.26 Ma (2 σ , N=38, MSWD=1.37 relative to 28.02 Ma FC). These data are normally distributed (see figure) with no evidence for xenocrysts or open system behavior (Ar-loss). Homogeneity on the single crystal level is further demonstrated by a 0.5 m.y. standard deviation of the age population, while the whole range of individual ages is less than 1% of the total age range (312.4 to 314.6 Ma).



References [1] Kunk M.J. and Rice C.L. (1994) *GSA Sp.P.* **294,** 105-113.