

## **Artificial ion tracks in volcanic dark mica simulating natural radiation damage: A scanning force microscopy study**

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*NUCLEAR INSTRUMENTS & METHODS IN PHYSICS RESEARCH SECTION B-  
BEAM INTERACTIONS WITH MATERIALS AND ATOMS 191 (2002) 346-351*

A new dating technique uses  $\alpha$ -recoil tracks (ART), formed by the natural  $\alpha$ -decay of U, Th and their daughter products, to determine the formation age of Quaternary volcanic rocks ( $<10^6$  a). Visualization of etched ART by scanning force microscopy (SFM) enables to access track densities beyond  $10^8 \text{ cm}^{-2}$  and thus extend the new ART dating technique to an age range  $>10^6$  a. In order to simulate natural radiation damage, samples of phlogopite, originating from Quaternary and Tertiary volcanic rocks of the Eifel (Germany) and Kerguelen Islands (Indian Ocean) were irradiated with U, Ni (11.4 MeV/u), Xe, Cr, Ne (1.4 MeV/u) and Bi (200 keV) ions. After irradiation and etching with HF at various etching times, phlogopite surfaces were visualized by SFM. Hexagonal etch pits are typical of U, Xe and Cr ion tracks, but the etch pits of Ni, Ne and Bi ion tracks are triangular. Surfaces irradiated with U, Xe, Cr and Ni ions do not show any significant difference between etch pit density and irradiation fluence, whereas the Ne-irradiated surface show  $\sim 14$  times less etch pit density. The etching rate  $v_H$  (parallel to cleavage) depends on the chemical composition of the phlogopite. The etching rate  $v_T$  (along the track) increases with energy loss.