DIRECT DEMONSTRATION OF MICROWAVE DEMAGNETIZATION OF A WHOLE ROCK SAMPLE WITH MINIMAL HEATING

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At the University of Liverpool microwaves have been employed as an alternative to conventional heating in palaeointensity determinations in an effort to reduce thermo-chemical alteration. There has been some confusion within the literature as to how much heating occurs, what the source of the heating is and how magnetic reorientation occurs. We address these issues through experiments that show conclusively that a sample of basalt may be demagnetized without significant heating through interaction with the magnetic component of the microwave field. It is shown that previous theoretical studies have failed to take into account the high dielectric loss exhibited by pyroxene and plagioclase feldspar, the main constituents of basalt. By innovative design of the microwave cavity we show how the electric field in the vicinity of the sample can be minimized, and that this in turn eliminates substantial heating. Perturbation theory is developed to characterise the fields within the cavity and their interaction with various materials leading to a fuller understanding of the physical processes underlying microwave demagnetization.

Palaeointensity, microwaves

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