

An evaluation of impact dating for shocked zircons with planar features (PFs) in the Vredefort dome by LA-ICP-MS multi-spot analysis

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Shock-metamorphosed zircons, as an indicator mineral of meteorite impact, have often been utilized for impact dating (e.g. Kamo et al., 2009). Mechanical and thermal effect by impact are thought to lead Pb-loss of shocked zircon, resulting in partly and fully age resetting. The 2.02 Ga Vredefort dome, largest and oldest impact crater, crop out highly-shock metamorphosed basement rocks which include shocked zircons with various shock features such as planar features and granular textures. Previous studies demonstrate that shocked zircons with planar features in the Vredefort show various metamorphic ages from 731 to 3104 Ma, and these ages are interpreted to be correspond to age resetting of regional metamorphism and impact metamorphism. Recent analysis using EBSD, SL and SRIMP for shocked zircon by Moser et al. (2011) reveal that shocked zircons with curvi-planar features have a potential for impact dating in the Vredefort (2.02 Ga), and EBSD misorientation map suggest that deformation of zircon by impact event enhances the age resetting. However, impact dating using shocked zircons with planar features has not been established. Erickson et al. (2013) reported SHRIMP U-Pb ages of detrital shocked zircon with PFs recovered from downriver of the Vredefort dome, and conclude that predominant impact age were identified and that most of shocked zircons record regional metamorphic events. Here we report impact resetting ages from detrital shocked zircons with PFs at the Vaal River sand, cutting along the Vredefort Dome, and identified zircon deformation texture revealed by EBSD misorientation maps. Such deformation in shocked zircon supposed to be formed by impact, and their deformation texture (PFs and EBSD map) may help to identify the ancient impact record.

Keywords: meteorite impact, impact dating, shocked zircon, Vredefort