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Platinum Group Elements in Proximal Impactites of the Bukit Bunuh Impact Structure, Malaysia

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The PGEs are commonly analyzed in the impact-melts and impactites from impact craters to confirm asteroid impact events. These geochemical data are considered as one of the best indicators of impactor asteroid contribution to terrestrial samples as these elements are strongly depleted in the Earth's crust. For example, the concentration of iridium (Ir) in bulk continental crust is only 0.037 ppb, whereas chondritic meteorites contain at least 300 ppb and Ir concentration in iron meteorite reaches up to 30000 ppb.

The Bukit Bunuh in Malaysia has recently been identified as an impact structure after the discovery of possible impact-melt looking rocks and impact breccias from this area. The granitic rock found in this area, also known as the Buloh Pelang unit, belongs to the Taiping pluton a large pluton member within Bintang Batholith (that makes up the Bintang mountain range). The exposed and cored granitic rock in the Lenggong area can be described as porphyritic to megacrystic with large euhedral K-feldspar; it is coarse grained, gray in colour, and contains biotite as its main mafic constituent. Various pyroxene-bearing mafic microgranular enclaves with coarse-grained rims can be found with the granite. The parent rock of the mylonite is believed to belong to the Buloh Pelang pluton because it is surrounded by this rock unit and shares similar rock texture. A total of 12 samples (three core samples of basement granites, five impactites including two impact-melt looking rocks and three impact breccia, and four mylonites) were analyzed in the present study.

The impact event is believed to have occurred around 1.34 to 1.84 Ma. Twelve impact-related rocks from this suspected impact structure were analyzed in the present study for Platinum Group of Element (PGE) contents. The sample population includes proximal impactites (two impact-melt rocks and three impact breccias) and possible impact-related rocks (four mylonites) and basement granite (three in number). The results showed no observable clear distinction between the impactites and basement granite. Compared to other asteroid impact sites in the world, the impactites and impact-related rocks in the Bukit Bunuh structure clearly contain a lower concentration of PGEs. Even though previous studies reported possible evidence of shock metamorphism in the Bukit Bunuh structure and electrical resistivity survey favored the presence of asteroid impact structure in this area as well, the absence of a clear projectile signature in our investigation on PGE hinders further discussion on the existence and nature of the impact. We suggest that the absence of any PGE signature in the Bukit Bunuh impactites could be indicative either of (1) an achondrite projectile, or (2) an oblique impact, or (3) the presence of a volatile-rich layer.

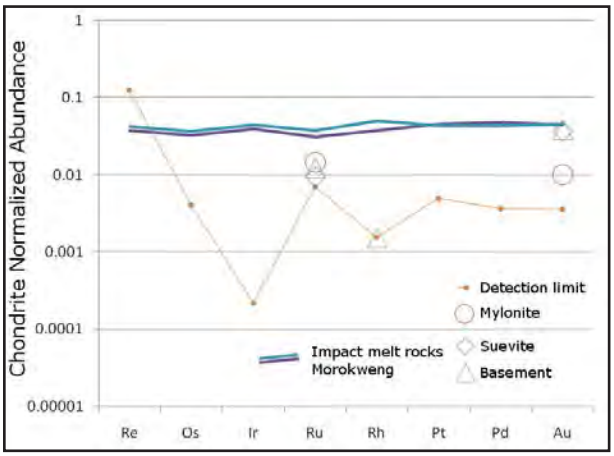

Figure (Top): Plot of platinum-group element and related metal abundances, normalized to carbonaceous-chondritic compositions. The impact melt rocks from the Morokweng impact structure, South Africa (MO-43 and MO-48), show a clear meteoritic pattern.

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