Characterisation, geochemistry and possible usage of the limestone hills in the Kinta Valley area, Perak

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The primary purpose of the characterisation of the limestone hills in the Kinta Valley is to determine their physical and geochemical characteristics with the aim of ascertaining their most appropriate economic or industrial usage. The limestone (or more appropriately termed *marble*) has very varied usage depending on their chemical and physical characteristics.

The limestone hills in the Kinta Valley extend from Gunung Temelang near Tg. Rambutan in the north to Gunung Gajah, near Kuala Dipang to the south, a distance of about 30 km. The marble outcrops in the Kinta Valley, in fact, form 3 groups of limestone hills trending more-or-less north-south.

The main physical characteristics that were considered for each hill included colour, presence of fractures, joints or veins, texture or pattern, grain size, resistance to weathering, contamination and foreign material (such as chert nodules, quartz, etc.).

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For their geochemical characteristics, the limestones were analysed for their $CaCO_3$, $MgCO_3$, SiO_2, Fe_2O_3 and Al_2O_3 contents. A thorough petrographic study was also carried out to determine whether they are calcitic or dolomitic and to detect the presence of other minerals which could jeopardise their quality and usage. Other than their $CaCO_3$ and $MgCO_3$ contents, the contents of Al_2O_3, SiO_2 and Fe_2O_3 are generally very low in the limestone samples; Al_2O_3 usually less than 0.25%, SiO_2 less than 0.55% and Fe_2O_3 less than 0.3%.

Geochemical analyses show that each limestone hill in the Kinta Valley has, generally, a distinctive, more-or-less homogeneous chemical composition throughout, except for Gunung Tempurung and Gunung Lanno. Hills with unusually high $CaCO_3$ content include Gunung Sepah (average 99.0%), Gunung Terendum (average 96.46%), Gunung Panjang (average 95.6%), Gunung Sentang (average 98.75%), Gunung Tasek (average 98.20%), Gunung Lang (average 97.35%), Gunung Mabella (average 98.3%), Gunung Rapat (average 96.8%), Gunung Karang Besar (average 97.8%), Gunung Merawan (average 97.1%), Gunung Toh Sembilan (average 95.5%), Gunung Pua (average 97.8%), Gunung Sin (average 97.9%) and Gunung Pipit (average 96.8%). Those with unusually high $MgCO_3$ content include Gunung Ayer Hangat (average 43.32%), Gunung Layang-layang (average 53.90%), Gunung Ginting (average 41.47%). Gunung Tambun (average 40.30%), Gunung Bercham (average 39.50%) and Gunung Temelang (average 38.80%), Gunung Keroh (average 40.7%), Gunung Kandu (average 40.8%) and Gunung Mesah (average 40.3%).

Based on their physical and chemical characteristics, the limestone resources in the Kinta Valley area that can be utilised as raw material for decoration like dimension stones, terrazzo or marble chips include Gunung Rapat, Gunung Lanno, Gunung Mabella, Gunung Sin, Gunung Tempurung and Gunung Terendum. In industries that require high calcium contents like cement, agricultural fertilisers, ammonia powder, animal feed, calcium carbide, the ideal hills are Gunung Datuk, Gunung Panjang, Gunung Rapat, Gunung Lanno, Gunung Karang Besar, Gunung Merawan, Gunung Toh Sembilan, Gunung Pua, Gunung Sin, Gunung Pipit, Gunung Sepah and Gunung Tempurung (south). In industries that require high $MgCO_3$ contents like magnesium fertilisers, glass, Gunung Air Hangat, Gunung Layang-layang, Gunung Keroh, Gunung Kandu, Gunung Mesah, Gunung Tempurung (north) should be considered. For use as aggregate and concrete most of the hills can be exploited except Gunung Karang Besar, Gunung Keroh, Gunung Kandu, Gunung Mesah. Finally for conservation in terms of religion, tourism and preserving the environment, Gunung Cheroh, Gunung Lang, Gunung Panjang, Gunung Datok, Gunung Rapat, Gunung Tempurung and Gunung Terendum are potential candidates.