

PAPER ID M06

Significance of silica geothermometry in groundwater studies of Quaternary aquifers in Kelantan

MOHAMMAD MUQTADA ALI KHAN^{1,*}, KISHAN RAJ PILLAI A/L MATHIALAGAN¹,
HAFZAN EVA MANSOR¹, ZAMEER AHMAD SHAH²

¹ Department of Geoscience, Faculty of Earth Science, Universiti Malaysia Kelantan, Campus Jeli, Locked Bag No. 100, 17600 Jeli, Kelantan, Malaysia

² Department of Geology, Aligarh Muslim University, Aligarh, 202002, Uttar Pradesh, India

* Corresponding author email address: muqtada@umk.edu.my, muqtadakh@gmail.com

Abstract: The distribution of silica concentration in shallow quaternary aquifers in parts of Kelantan, Malaysia were assessed to monitor the groundwater and surface-water interaction, to determine the depths, residence time duration of groundwater and to evaluate groundwater contamination by correlating silica with hydrogeochemical data. In the present study, silica concentrations were analyzed in 29 groundwater samples during two time periods. The concentration of silica ranged from 6.3 mg/l to 23.4 mg/l for pre-season (2016) and 6.2 mg/l to 23.5 mg/l for post-season (2016). By employing silica geo-thermometry based on chalcedony equation, the range of temperature estimated from 3.09 °C to 37.61 °C during pre-season and 0.90 °C to 37.79 °C for post-season which under normal geothermal conditions would correspond to a depth range of 0.02 km to 0.32 km during pre-season and 0.01 km to 0.32 km for post-season by considering an average heat flow of 30 °C/km. These shallow depths (below 0.32 km) of groundwater circulation are pretty reasonable for such deficient silica concentrations. Such low silica levels reflect minimal involvement of anthropogenic activities and small residence time of groundwater in terms of rock-water interaction. These low silica values also show that the water in the area is of recent meteoric and through surface water interaction.

Keywords: Silica concentration, shallow aquifers, Kelantan, Malaysia