



Scaling Tendency of Geothermal Waters Armutlu Peninsula, Northwestern Turkey

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Prediction of scaling tendencies from geothermal waters is important for taking necessary precautions to prevent or control the scale formation. This study contains scaling tendency of geothermal outlets occurring through Armutlu Peninsula in Northwestern Turkey. The E-W trending region stretches into the Marmara Sea (ca. 117 km E-W by 45 km N-S) and is bounded to the north and the south by North Anatolian Fault Zone (NAFZ). The two branches of NAFZ traversing the peninsula control not only active seismicity but also geothermal discharges of the region. Widespread basement rocks across the peninsula including metamorphic assemblage of granitic and volcanic rocks host geothermal fluids. The two distinctive geothermal discharges (Armutlu and Yalova) take place through lineaments appurtenant to the northern branch of NAFZ. Their discharge temperatures of 65 °C (Yalova) and 70 °C (Armutlu) are the highest of the region. According to their water chemical results, scaling tendency were computed by using WATCH for different temperature steps under the assumptions of single-stage adiabatic boiling and equilibrium degassing. To evaluate their scaling tendencies, mean geothermal reservoir temperatures were computed by using chemical geothermometers. Scaling tendencies were plotted for calcite, amorphous silica and quartz minerals for different temperature values including reservoir temperatures. Their scaling behavior reveals that oversaturation with calcite and quartz minerals are rapidly attained for the geothermal fluids (Yalova and Armutlu) at relatively lower temperatures. Regarding amorphous silica, they are completely undersaturated. Besides, Langelier Saturation Index (LSI) and Ryznar Stability Index (RSI) were calculated. Their results depict scale formation due to being positive LSI and less than 6.0 of RSI values.