

Application of chemical geothermometers to estimation of reservoir temperature in the low-enthalpy geothermal area: İkizdere-Ayder (Rize), Turkey

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The oldest units in the study area are the Late Cretaceous volcanic rocks composed of andesite, basalt, dacite and pyroclastic rocks containing red limestone, sandstone and marl interbeds. Late Cretaceous-Tertiary aged granitoids composed of granite and granodiorite type rocks are outcropped on a large part of the area. Magmatic rocks are cut by doleritic dykes in places.

Temperature in geothermal well is 55°C, Electrical Conductivity (EC) value is 255 µS/cm, and pH value is 9.2 in the Ayder while these parameters are 63°C, 6913 µS/cm and 7.2 respectively, in the İkizdere. The water types were determined as Na-Ca-HCO₃ in İkizdere and Na-Ca-CO₃-SO₄ in Ayder. In this study, reservoir temperatures of geothermal fields were calculated using chemical geothermometers. Thermal waters are “immature waters” which indicates that these waters are shallow or mixed, and thus have not yet reached the water rock equilibrium in the region. In this study, silica geothermometers were applied to calculate the reservoir temperatures for the thermal waters. The reservoir temperature values were calculated as 48-100°C for Ayder and 50-149°C for İkizdere. Silica-enthalpy mixture models were applied to the geothermal areas, and reservoir temperatures are determined as 120°C in Ayder and 168°C in İkizdere. The mixing ratio of hot water to the cold water in the İkizdere and Ayder was calculated as 40% and 50% respectively.

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