

**GEOCHEMICAL CHARACTERIZATION AND GEOTHERMOMETRY OF THE
KAPURELLA GEOTHERMAL SPRING, SRI LANKA**

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The Kapurella geothermal spring, situated in a metamorphic terrain in Ampara District, Sri Lanka, has been the subject of a comprehensive geochemical analysis to understand its geochemical properties. The study analysed the chemical composition (major cations and anions) of the hot spring water and employed various geothermometry techniques to estimate reservoir temperatures. Cation analysis revealed that sodium (Na) is the most abundant element, with 338.68 mg/L, attributed to the dissolution of sodium-rich minerals like feldspars in the granitic/granitic gneiss rocks of the region. Calcium (Ca) and potassium (K), with concentrations of 19.81 mg/L and 7.02 mg/L, respectively, derived from calcium-bearing minerals like calcite, biotite, and K-feldspar were also significant. Other trace elements such as strontium (Sr), magnesium (Mg), lithium (Li), iron (Fe), and manganese (Mn) were observed in lower concentrations, reflecting their limited solubility and low abundance in the rocks in the area. Water samples of Kapurella spring were compared with other geothermal springs of different geological terrains (igneous, sedimentary and metamorphic) in different countries across the world using a Na, K and Ca tri-plot. Results indicated that regardless of the geological terrain, the major cationic ratios remain similar. While chloride (Cl⁻) 407.5 mg/L, sulfate (SO₄²⁻) 169.2 mg/L, and fluoride (F⁻) 9.2 mg/L were observed as major anions in Kapuralla spring water, and the total dissolved solids (TDS) concentration was measured as 377.74 mg/L. Geothermometry calculations provided reservoir temperature estimates as, 75.44 to 131.69 °C (with Na-K geothermometer), as 99.42 °C (with Li-Mg geothermometer), and as 168.92 °C (with Li-Na geothermometer). The Na/1000, K/100, and √Mg tri-plot analyses classified the water as “partially equilibrated”, relevant to high-temperature water and indicating the mixing of cold water. Overall, this study enhances the understanding of the geochemical properties of the Kapurella geothermal spring, contributing valuable insights into its geothermal potential and regional geological context.

Keywords: Geochemical analysis, Geothermal explorations, Geothermometry, Kapurella geothermal spring