Discrimination of emerald origins by chemical components

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Laser ablation-inductively coupled plasma-mass spectrometry (LA-ICP-MS) and Electron probe analysis (EMPA) were used to determine the concentration of 30 elements, i.e. Li, Be, B, Na, Mg, Al, Si, P, K, Ca, Sc, Ti, V, Cr, Mn, Fe, Co, Ni, Ga, Ge, Nb, Sr, Y, Zr, Nb, Mo, Cs, Ba, La and Ta in 36 emerald samples from various localities and different types of synthesis. The concentration of principle elements may allow us to specify wherether the sample is natural or synthetic in the first place. In addition, this approach can provide information regarding geographic origins of emeralds.

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Arsenic and mercury enrichments in the sediments of the geothermal springs of Playa Santispac, Concepcion Bay, Baja California peninsula

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The fluids of the intertidal geothermal springs, found in the western coast of the Concepcion Bay of the Baja California peninsula, are enriched in some elements. The objective of this study is to characterize elemental composition of the surface sediments collected in the discharge points and adjacent area. The obtained results show that the sediments of three geothermal springs of the mangroves of the Playa Santispac are strongly enriched in Hg (0.55 - 25.16 mg kg^{-1}). The concentration of this element decreases rapidly in the sediments of the mangroves lagoon (0.023-0.233 mg kg^{-1}) and is in the range 0.006 - 0.060 mg kg^{-1} in the marine sediments collected in front of Playa Santispac. The arsenic displayed elevated contents in the sediments of the geothermal springs (13.4 - 111.2 mg kg^{-1}), low levels in the sediments of the mangrove lagoon (0.7-2.6 mg kg^{-1}) and in the marine sediments of a zone adjacent to Playa Santispac (1.4 ± 1.1 mg kg^{-1}). The manganese, important component of the geothermal and hydrothermal discharges revealed the similar trend. Its elevated contents (9120 mg kg^{-1} and 2500 mg kg^{-1}) were found in the sediments of the second and third geothermal spring, only 460 mg kg^{-1} in the first geothermal spring decreasing till 106-255 mg kg^{-1} in the sediments of the mangrove lagoon and smaller contents 31-125 mg kg^{-1} in the marine sediments, collected in front of Playa Santispac. The crust of the wall of the second geothermal spring of the mangroves of the Playa Santispac is characterized by very high contents of Mn (10.35 %) and of As (637 mg kg^{-1}), comparing them with the sediments of the proper hot spring and of the surficial sediments of the study area. The enrichment of the sediments of the geothermal springs of the Playa Santispac could be the result of the fixing of the As and Hg in reduced, less soluble forms, such as sulfides and of the formation of the manganese minerals or coprecipitated with other insoluble carbonates or silica.