

SUMMARY

15 samples of gem opals were analyzed by laser ablation inductively coupled plasma mass spectrometry (LA ICP-MS) and inductively coupled plasma mass spectrometry (ICP-MS). For this study were selected the most representative samples from Slovakia, Australia, Peru, Ethiopia, Mexico, USA and the Czech Republic. These samples were obtained from private collections.

The study focuses on the geochemical relationships between various forms of opal originating from igneous and sedimentary environments based on the results from LA ICP-MS and ICP-MS. The major and trace element compositions are unique for each studied opal locality and important for understanding numerous aspects of opal formation. Major element analysis shows that opals are essentially pure SiO₂ (77 – 92 wt. %). Al, Fe, Ca, K, Na and Mg are the main elemental impurities. The concentrations of the trace elements vary strongly depending on the opal locality. Differences were found, e.g., in the concentrations of REE and some refractory elements, which might be indicative for determining the provenance of opals.

Many studies have been published explaining the origin of luminescence, microstructures and the thermal properties of opals. However, there are very few comprehensive studies comparing gem opals from the most important historical and mineralogical deposits. The data obtained in this study could also be useful for understanding the chemistry of opal fluids and distribution of elements during opal deposition.