

Electron microprobe study of lapis lazuli to determine provenance

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The illegal mining of lapis lazuli, a bright blue semiprecious mineral aggregate, in Afghanistan is fuelling conflict in the region, with half of illegal mining revenue going to insurgent groups. Other lapis lazuli deposits are located in Chile, Tajikistan, and Russia, and depending on the origin of the sample, the ore contains differing quantities of lazurite, pyrite, and other minerals within the lapis matrix. This study is a pilot project to determine if the origins of the lapis lazuli can be effectively pinpointed using techniques such as transmitted and reflected light microscopy, X-ray diffraction, and electron microprobe. A Chilean sample was characterized and compared to samples sold as Afghan. The results from our X-ray diffractogram confirm our thin section analysis, in which the peaks for Chilean sample indicate the presence of lazurite, wollastonite, and pyrite, and the peaks for the Afghan sample indicate the presence of lazurite and diopside. Electron microprobe analysis of lazurite and pyrite from the two “Afghan” samples indicate they came from different mines within the same region. The lack of wollastonite demonstrates that they are not from Chile. Reflected light microscopy verified that the pyrite samples contain no alteration which is characteristic of Russian lapis lazuli. The nickel content in the pyrite, as analyzed by the electron microprobe, fit into the parameters for potential Afghan provenance; however, copper content was below detection limits, and therefore could not be distinguished as Afghan or Tajik. More work is necessary to characterize the pyrite chemistry in order to determine potentially significant conflict origins. [Poster]