

GREEN OPALS FROM BAHIA, BRAZIL, REVISITED

Carolina Souza Santiago¹, Luiza Rodrigues Rocha², Jurgen Schnellrath¹

¹Centro de Tecnologia Mineral; ²Universidade Estadual do Norte Fluminense

There are two known Brazilian occurrences of “green” opals in the State of Bahia. The first one lies in Boa Nova, Southern Bahia, and produces a common opal that presents itself in various shades of green and yellow. The second occurrence is of greenish to brownish opals, that locally may present a cat’s eye effect, from Socotó.

Collected samples were characterized at CETEM’s Gemological Research Laboratory by conventional gemological tools and advanced analytical methods, including EDXRF, XRD, SEM/EDS, Raman and UV-VIS-NIR spectroscopy.

Regarding the “green” opals from Boa Nova the color variations are due to the presence of three different coloring elements, namely nickel, iron and chromium, in variable amounts. Visible absorption spectroscopy shows that all these elements have an important contribution to the coloration of these opals. Inclusions containing chromium and iron as major constituents are described and could possibly be the source of these elements responsible, respectively, for the deep green and yellow colors of the stones. Despite nickel playing an important role as the main coloring element in the “apple green” opals, we were not able to identify the source of this element. Nickel must be finely dispersed throughout the whole opal matrix.

“Cat’s eye” opals from Socotó have been investigated in regard to the nature of the fibers responsible for the chatoyancy, but also to shed some light on the cause of the greenish to brownish colors of these stones. Despite having the same coloring elements observed in Boa Nova opals, their amounts are quite different. There is a much higher iron content, also more chromium, but nickel plays a less important role in the color of these opals, as demonstrated by visible absorption spectroscopy. Chromite inclusions were found, but again no nickel containing phase. It is interesting to note that many parts of the opals, that show a greenish color when observed in reflected light, are orange-yellow in transmitted light. This indicates that, apart from the chemical contribution, there is also an important physical component resulting from backscattered light (Rayleigh scattering) influencing the colors of these opals.

X-ray diffraction and Raman studies confirmed the low crystallinity degree of these opals (CT-opals), which is corroborated by their low values for specific gravity and refraction indices when pure. These methods also revealed the intergrowth of opal with other phases. SEM studies further disclosed the complex micro-texture of the opals, specially of the “cat’s eyes” from Socotó. In opals from Boa Nova the fine intergrowth occurs with minerals of the talc and serpentine group, but the mineralized veins do also contain a high amount of chalcedony with manganese dendrites. For opals from Socotó the fine intergrowth occurs with minerals of the serpentine and chlorite groups. Chromite inclusions are also very common in samples from this area.

KEYWORDS: green opal, cat’s eye, Bahia