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GEMMOLOGICAL AND SPECTROSCOPIC STUDY WITH MOBILE INSTRUMENTS OF THE “EMERALDS” FROM THE FRENCH CROWN JEWELS

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Rare are the scientific studies on gemstones from the French Crown Jewels, for the good reason that most of them were sold away by the French Third Republic in 1887, to get rid of this symbol of Royalty and Empire. Some unset stones were however put aside from the big sell, and given to some French museums, including the French Natural History Museum, the Louvre, and the Paris School of Mines. Some jewels have been bought back since the late 20th by the Louvre, but mostly, the Crown Jewels are still spread out around the world.

This paper is part of an ongoing project on the study of the French Crown Jewels owned the Paris School of Mines since 1887, in collaboration with the French Gemmological Laboratory (LFG). As this National Treasure is security sensitive, the project had to be conducted on site at the MINES Paristech Mineralogy Museum, using portable analytical instruments. In this first study, we are presenting the results acquired on some green coloured gems that used to be part of the coronation Crown of Napoleon III. Before it was melted down in 1887, the crown was adorned with 8 relatively large emeralds weighing from 14.5 to 23.7 carats as well as 8 relatively large diamonds weighing from 17 to 26.3 carats. Fifty smaller emeralds were also adorning the crown: 34 at the top and 16 at the bottom of it. These 50 smaller emeralds were part of the donation to the Paris School of Mines in 1887. Today, 33 out of the 34 samples from the top of the crown as well as 12 out of 16 samples from the bottom are catalogued in the Museum's collection.

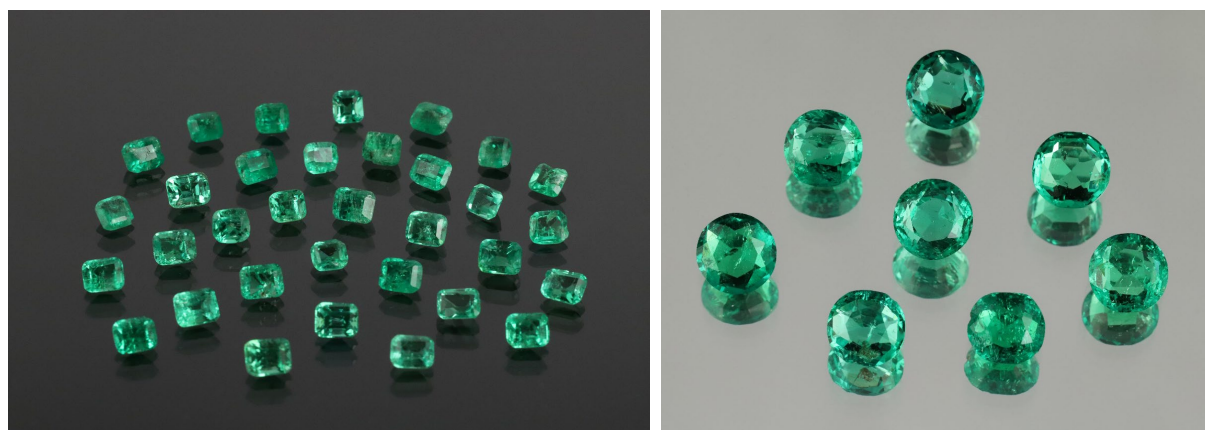


Figure 1: Emeralds originally set in the coronation Crown of Napoleon III, most likely from Colombia. Left: 33 smaller emeralds weighing from 0.18 to 0.41 carats (ENSMP 69880). 8 larger emeralds weighing from 0.85 to 1.34 ct (ENSMP 69866) © Musée de Minéralogie MINES ParisTech / Eloïse Gaillou.

All 45 green stones were observed macroscopically and under optical microscope (up to 80x). Raman spectra were carried out using a mobile Raman spectrometer with a 532 nm excitation wavelength, Vis-NIR spectra were acquired from 365 to 1000 nm using an integrating sphere and FTIR spectra from 400 to 8000 cm^{-1} using a DRIFT accessory.

33 of the studied gems are faceted in octagonal/step cut weighing from 0.18 to 0.41 carats (Figure 1) and 12 samples are in round/brilliant cut (with one oval shaped) weighing from 0.70 to 1.34 carats. All 33 octagonal samples and 8 of the roundish shaped samples present Raman spectra characteristic of beryl (Bersani et al., 2014). The other 4 roundish shaped samples present large bands in the Raman spectra often observed on some glasses (Robinet et al., 2006). Natural multiphase inclusions, colour zonation and in some cases “gota de aceite” structures are observed in all 41 beryl samples. On the other hand, air bubbles are observed in the 4 glass samples. Vis-NIR spectra of the 41 emerald samples display absorption bands related to chromium and vanadium; no absorption bands related to iron were observed (Figure 2; Wood and Nassau, 1968). The 4 glasses present bands linked to iron (Carl et al., 2007). FTIR spectra of the 41 emeralds present bands linked with low alkali content emeralds and the four glasses some large bands.

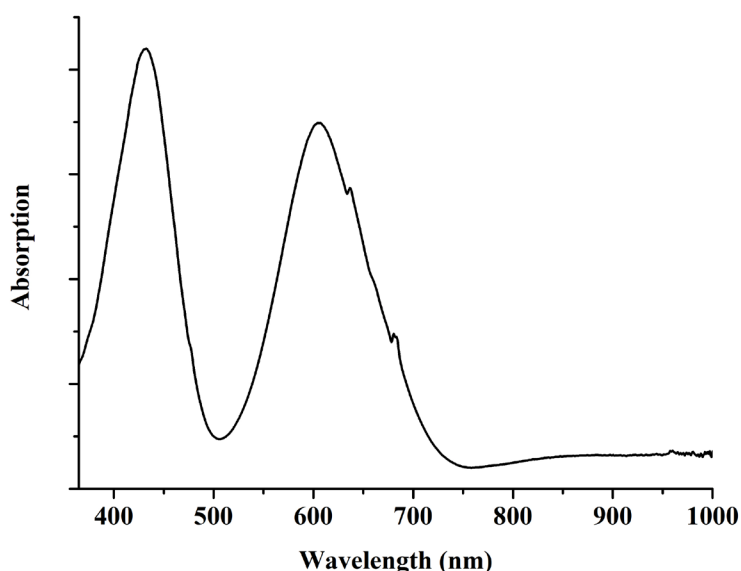


Figure 2: Vis-NIR absorption spectrum from 365 to 1000 nm of an emerald originally set in the coronation Crown of Napoleon III displaying bands related to chromium and vanadium.

With the combination of spectroscopic and microscopic methods, the 41 green gems originally set in the coronation Crown of Napoleon III are identified as natural emeralds with Colombia as their most probable source (Saeseaw et al., 2019). The other 4 stones are identified as green artificial glasses. It is currently still unknown whether these 4 glass stones were set from the beginning in the crown or exchanged at a later stage.

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