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Application of mineralogical techniques to gemmology

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Abstract: The remarkable scientific advances in gemmology bring about a notable development of practical aspects in allied disciplines, especially mineralogy and physical chemistry. The cause of this progress can be mainly ascribed, on one hand, to the development of sophisticated instrumentation even outside the strict field of pure research, and, on the other hand, to the encouragement from distinguished traders in the field, where thorough certification of the nature of the precious stones in valuable pieces of jewellery is nearly always required by the buyer.

For this reason, besides improvements in our knowledge of the principles of crystal optics, modern physical-chemical procedures such as Raman and infra-red spectroscopy, microprobe analysis, X-ray diffraction, etc. are becoming routine. Considerable progress in gem synthesis has also been achieved, and advanced theoretical work on various physical properties (*e.g.* colour) is being undertaken.

Whereas the contributions of mineralogy, chemistry, and physics to gemmology are well known, it is surprising to consider that gemmology also may substantially contribute to the development of pure science, and this feedback of information may involve even theoretical aspects.

Key-word: gemmology.

Until quite recently, the language of most jewelry traders did not include many scientific terms, and the judgement of quality of a certain stone was usually based on overall practical knowledge, involving a particular personal experience, difficult to properly define. In these few last years, however, we can see a remarkable spread of scientific terms and routines (mostly mineralogical) among gem dealers and gemmologists: even crystallography itself, which for long has almost invariably been considered as irrelevant by ordinary people (including students) has gained substantial attention from the layman.

Following this trend, the absorption of scientific knowledge by practical operators in the gem field is still continuing at a surprising rate. At the same time, many gemmological laboratories continue to improve their scientific equipment, and electron microprobes, X-ray diffractometers, infrared and Raman spectrometers, etc. are no longer a rarity. In times, it was difficult to find any scientific instrument in a gemmological laboratory besides refractometers, direct-vision spectroscopes or Westphal balances.

Why have traders (or directors of laboratories) changed their attitude in favour of more careful consideration of scientific knowledge, and why is this change not restricted to a well-qualified minority, but it is fairly widespread? There are four good reasons at least for explaining this:

1) In recent times, a written guarantee about the nature and the quality of the stones employed in a certain piece of moderately important jewellery is requested by almost any buyer; these requirements become imperative for important pieces or for the most distinguished dealers.

2) In contrast to the past, there are now very many different gemmological materials (natural and especially synthetic), and new varieties are appearing on the market at a surprising rate: therefore, an operator in this field is required to have a consistent professional training for identifying them properly. This professional experience has to be continuously kept up to date, and should include a considerable amount of basic scientific knowledge.

3) It is realized even by the general public that a certain stone should be cut following certain crys-

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