

Color Measurement of Fancy Diamonds Applying Computer-based Multichannel Spectroscopy

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The four (a-d) main pieces of equipment used to color grade diamonds by means of computer-based multichannel spectroscopy.

Color description of diamond is an important part of quality analysis. Although master diamond sets are used for the color grading of nearly colorless diamonds, no colored master stones are applied to the grading of the wide range of known fancy diamond colors. Color grading by machine has been reviewed in the literature, but the technique still needs to be improved (Collins, 1984).

The newly proposed system includes (see figure): (a) a sample chamber that contains an integration sphere and a Xenon flash lamp; (b) fiber optics for the collection of transmitted light and supply to the spectrometer; (c) a dual-beam multichannel spectrometer (Zeiss) to measure transmission in the visible range (360–780 nm); and (d) an AT portable computer to calculate hue, tone, and saturation from the absorption spectrum.

The limits of the colorimeter were tested by the measurement of: (1) glass specimens of variable size and geometry (cut, shape, and proportions), but of identical material; (2) diamond master stones (D–I), which represent test samples of comparable hue, geometry, and size, but increasing in saturation; and (3) fancy-color diamonds of different size, geometry, and color (purple to pink, yellow to orange, orange to brown, gray to blue, and yellowish green to bluish green natural-color series).

The obtained color data varied according to the size and geometry of the samples in experiment 1 due to the complexity of the light paths in the samples. Measurement of individual samples shows high reproducibility. The accuracy of the measured saturation during experiment 2 was sufficient to determine the known saturation level of the master stones.

The visually determined subjective differences in color between diamonds of the various color series were measured during experiment 3. The color data of unknown samples can only be interpreted if they are compared with those for known samples of similar weight and geometry. The data have been compiled in a databank for comparison purposes.

Collins A.T. (1984) Pitfalls in color grading diamonds by machine. *Gems & Gemology*, Vol. 20, No.1, pp. 14–21.