

## THE COLOUR OF NATURAL AND TREATED ELBAITE - SCHORL TOURMALINES FROM BRAZIL

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A comparative study of natural and treated green, blue and pink tourmalines from Minas Gerais, Brazil using electron paramagnetic resonance (EPR) and optical absorption is reported. Electron-micro-probe analyses indicate that all samples belong to elbaite-schorlite series with Fe and Mn contents in the same proportions. The last one is unusually high for typical green and blue Fe-bearing elbaites. On the other hand the pink elbaites contain nearly the same Mn concentration but no detectable Fe. EPR spectra of the green and blue tourmalines indicate the presence of high concentrations of Fe with unusual broad EPR linewidths, about 0.1T, probably due to spin-spin interactions caused by the high concentrations. Another reason for the large linewidths could be disorder. From Mössbauer spectra we conclude that Fe is dominantly in its 2+ charge state and incorporated in Y and Z sites, with 85% to 15%, respectively. Optical absorption measurements show four dominant bands at 410, 470, 660 and 720 nm for the green and three at 420, 470 and 720 nm for the blue specimen. In the pink tourmalines three dominant absorption bands centered at 390, 520, 530 and 630 nm have been detected. They are related with optical transitions of Mn. EPR spectra indicate the presence of Mn<sup>2+</sup>. From irradiation and heat treatment we conclude that the Mn<sup>2+</sup> is the precursor of the pink color in this type of tourmaline. Irradiation intensifies the pink color whereas heat treatments at about 4500C decolourize the pink tourmaline. At about the same temperature dark green tourmalines tend to lighten in colour and blue ones lose their colour.