Bluish-Green Zoisite From Merelani, Tanzania

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Since the first publication on the blue variety of zoisite, called tanzanite, from Merelani, Tanzania (Bank et al. 1967), this mineral has become an important gemstone. The colour is caused by traces of vanadium, replacing Al^{3+} in the crystal structure of zoisite (Hurlbut 1969). The absorption spectra of this blue zoisite has led various working teams to different interpretations of the absorption bands (Faye & Nickel 1971; Tsang & Ghose 1971). Most probably, the Al^{3+}-positions are occupied by tri- and tetra-valent vanadium ions (Schmetzer 1978). The colour change of the zoisite crystals from Merelani through heat treatment to approximately 500°C is caused by the disappearance of an absorption band in the blue part of the visible spectrum (at 22,000 cm^{-1}). The following scheme of pleochroism before and after heat treatment is given:

crystals before heating		
X	a	reddish-purple
Y	b	blue
Z	c	yellowish-brown

crystals after heating		
X	a	reddish-purple
Y	b	blue
Z	c	blue

Green zoisite from Longido in Tanzania, which is coloured by Cr^{3+}, was first reported by Game (1954). The absorption bands in its spectrum are attributed to Cr^{3+} -ions, which have been already described for vanadium, and are located on Al^{3+} -positions in the zoisite lattice (Schmetzer & Berdesinski 1978).

Some time ago, one of the authors discovered in rough zoisite crystals from Merelani numerous bluish-green stones, showing a pleochroism differing from that of pure blue zoisite. When heated up to 500°C, these stones also changed their colour. The pleochroism of heat treated and non-heat treated stones of this bluish-green type is mentioned in the following scheme:

crystals before heating		
X	a	reddish-purple
Y	b	bluish-green
Z	c	greenish-yellow

crystals after heating		
X	a	reddish-purple
Y	b	blue
Z	c	bluish-green

The optical and crystallographic values of the bluish-green zoisites do not differ from the respective parameters of the blue zoisites. The absorption spectra of the bluish-green varieties show all bands of the vanadium-bearing blue crystals from Merelani and those of the chromium-bearing zoisites from Longido. Microprobe analysis confirms the spectroscopic investigation: the bluish-green crystals contain nearly equal contents of vanadium and chromium (0.06% V, 0.07% Cr), whereas, the iron contents of bluish-green and blue zoisite from Merelani remain very low (0.001% Fe).

The bluish-green zoisite from Merelani must be regarded as coloured by both vanadium and chromium. We regret that we could not find out in which part of Merelani deposit these bluish-green crystals occur. Therefore, there is no possibility to discuss the genesis.

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