

Spectral changes of zircon at elevated pressure

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We have studied pressure-induced changes of Raman spectral parameters of zircon. Diamond anvil cell experiments up to 9 GPa were done with a synthetic $ZrSiO_4$ crystal grown using the Li-Mo flux technique (HANCHAR et al., 2001). At elevated pressures, Raman bands of internal SiO_4 modes shift to higher wavenumbers but show only moderate band broadening (Fig. 1). Zircon inclusions in gem-quality ruby were found to be affected by “fossilised” pressures below 1 GPa (WANTHANACHAISAEANG et al., 2006). The FWHM increase at such low pressures is almost insignificant and, thus, does not affect the quantification of the degree of radiation damage from Raman spectra. Strong band broadening of zircon inclusions is therefore a reliable indicator of self-irradiation and allows one to check for potential high-T treatment of gem specimens.

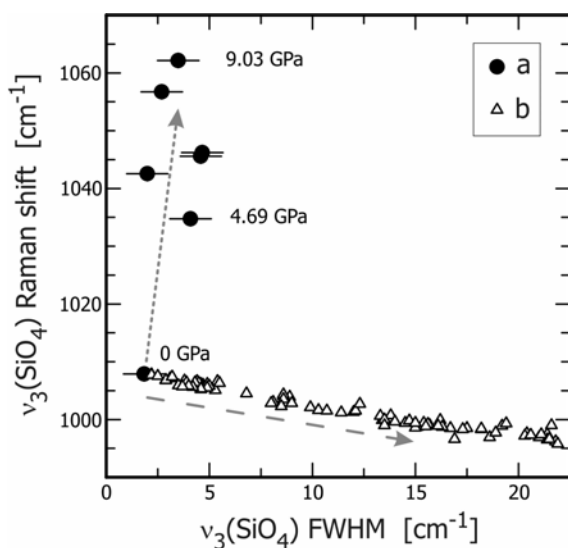


Figure 1. Plot of position vs. FWHM (full width at half band maximum) of the main zircon Raman band. The trend of spectral changes with increasing pressure (a) deviates appreciably from the trend of spectral parameters caused by self-irradiation (b = data for zircon samples from Sri Lanka; from NASDALA et al., 2001).

References

HANCHAR, J.M. et al. (2001): Am. Mineral. 86. 667–680.

NASDALA, L. et al. (2001): Contrib. Mineral. Petrol. 141, 125–144.

WANTHANACHAISAEANG, B. et al. (2006): Gemmologie 55, 119–132.