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NOTE

Role of Trace Elements in Natural Amethysts in Colouring

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In this study, a research has been conducted on trace elements that are likely to colour natural amethyst, a semi-precious gemstones. The trace elements of two amethyst samples, one in purple and the other one in lilac, which were procured from Dursunbey (Balikesir, Turkey) were defined. Comparing the trace elements obtained with the previous studies, it was concluded that the colour purple intensified as Fe and Mn proportions in amethysts increased and the colour purple turned into a lighter purple, which was lilac as the proportion of Sb element diminished.

Key Words: Amethyst, trace elements, Fe, Mn, Sb.

The mingling of hot hydrothermal water with oxygen-rich cold meteoric water in relatively near surface conditions results in the formation of amethyst because these oxidizing conditions form trivalent iron which provides the colour purple to amethyst[1]. It has been stated that the colour centers related to Fe impurity cause the colour purple in amethyst[2,3]. Iron may be present in quartz in three valence states, Fe^{2+}, Fe^{3+} and Fe^{4+}. All three states may be present in interstitial sites, only Fe^{3+} being in a substitutional Si^{4+} site[4]. Cohen and Makar[5] found that the Ti^{3+} related rose colour in single crystal rose quartz.

Sampling and analyses: Two natural massive amethyst samples utilized in this study were procured in Dursunbey (Balikesir, Turkey) samples, located in Western Anatolia. Amethysts were coloured according to criteria in Taylor *et al.*[6]. According to these criteria, two samples were fixed as purple and lilac amethysts. Semi-quantitative analyses of trace elements in the samples were carried out in Philips PW-2404 wavelength dispersive X-Ray Fluorescence Spectrometer instrument. In analyses, Al, As, Ca, Cl, Cr, Cu, Fe, K, Mg, Mn, Na, Ni, P, Rb, S, Sb, Ti and Ga elements were determined as ppm.