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Variability within and between large bodies of Muong Nong-type tektites in Laos

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1. Introduction

Basic features characterizing Muong Nong-type (MN) tektites include their irregular shape, blocky and layered appearance, structural and chemical inhomogeneity, and generally larger sizes than splash or ablated forms [4]. The MN tektites are most widely distributed in Australasian tektite (AAT) strewn field. Presence of zircon, quartz, rutile, monazite and decomposed Al_2SiO_5 in MN AAT indicates, according to [3], that their parent material is of detrital sedimentary origin with a metamorphic component. Two largest single fragments of MN tektites reported in literature weigh 24 kg each [2]. However, mass of the largest known MN is much higher: large fragmented bodies may have been as large as 1,000 kg [1]. Since only a limited number of chemical analyses evaluating the compositional variability within and between these large tektite bodies are available [5], we decided to analyze fragments of MN AAT from them.

2. Results

We sampled three MN AAT bodies in Laos labeled here as DB-5, DB-115 and DB-118. The body DB-5 is located close to Ban Tako at 16.37315° N, 106.45483° E, and is identical to the object reported by [1] weighing ca. 1,000 kg. The location of the DB-115 body is 16.46150° N, 106.48917° E and expected weight is 200 kg. The object DB-118 is situated close to Muong Nong at 16.39509° N, 106.49630° E and its weight is ~200 kg. All the bodies are fractured and sizes of excavated shards varies in broad range from grams to hundreds of grams. Polished thin sections were manufactured from the fragments and chemical composition measured with electron probe microanalyzer (EPMA) and laser ablation inductively coupled plasma mass spectrometer (LA-ICP-MS). Major, minor and trace element compositions of all fragments show that there is a high compositional variability between individual bodies as well as within them (Figs. 1 and 2). The magnitude of this variability is larger than that reported in [5]. Tight negative correlations between all major element oxides vs. silica observed generally in tektites [4] is not found for Na_2O and K_2O in this dataset. Major element contents indicate presence of mutually compositionally different domains/layers within individual fragments (samples 3 and 23 of DB-118). Nickel content in fragments of the DB-115 body is extremely variable and some of excavated shards are highly enriched in this element. Such high Ni concentrations accompanied by elevated contents of Co and Cr may already be considered indicative of low contents of projectile material. Concentrations of volatile (Pb, Zn, Cu) as well as refractory (W) elements are more or less invariant in fragments of DB-115 whereas it varies in remaining samples. Strong positive correlation of otherwise lithophile elements (Cr and Mn) with siderophile Ni may support high temperature origin of MN AAT as long as this change of chemical behavior is known only at elevated T.

3. Summary and Conclusions

Three large MN AAT bodies display compositional variability on regional, local as well as individual fragment scales. Correlation of contents of siderophile and lithophile elements provides a support for high-T origin of tektites. Elevated concentrations of Ni, Co and Cr can be interpreted as a potential admixture of meteoritic component though further studies (e.g., contents HSE, Os or Cr isotope systematics) are required to resolve this issue.

Acknowledgements

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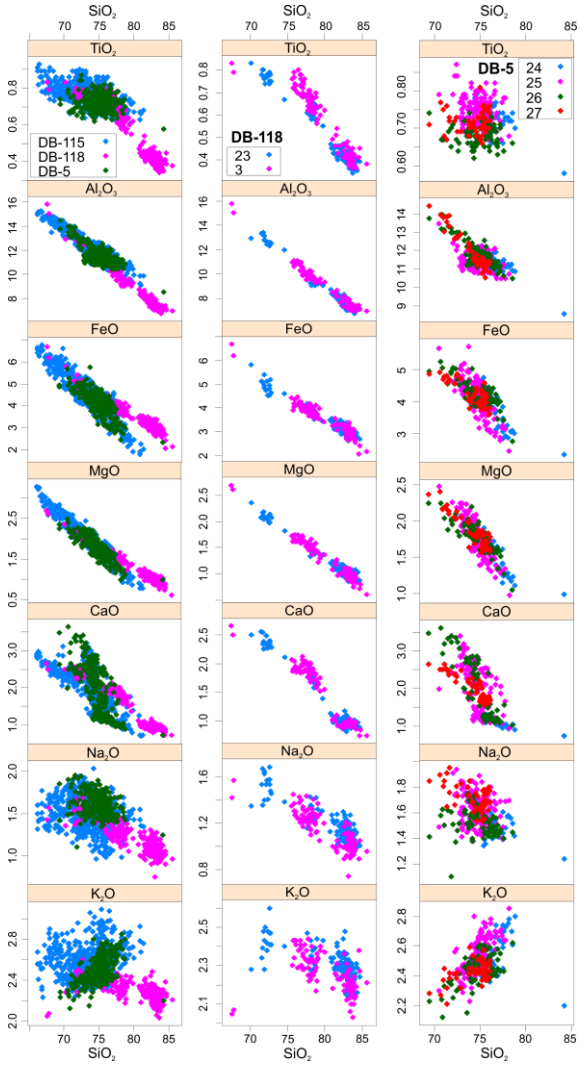

Figure 1: Major element compositions (in wt.%) determined by EPMA in fragments excavated from three large MN AAT bodies in Laos.

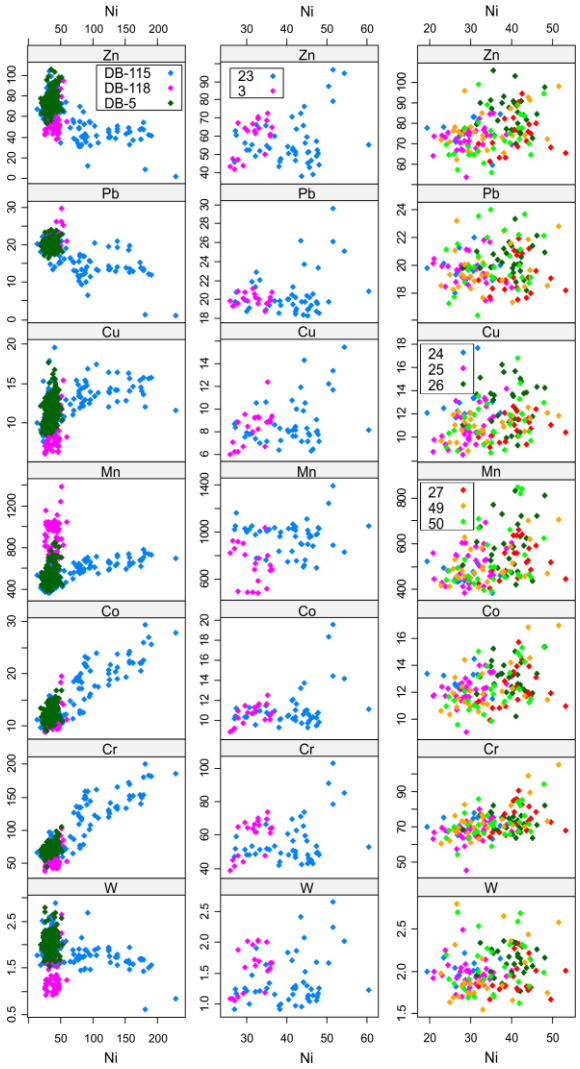

Figure 2: Selected minor and trace element compositions (in ppm) determined by LA-ICP-MS in fragments excavated from three large MN AAT bodies in Laos.

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