DISCRIMINATION BETWEEN TECTONIC ENVIRONMENTS OF OBSIDIAN SAMPLES USING GEOCHEMICAL DATA

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Geochemical analysis of obsidians is of great interest to archaeometry. From the geological point of view, the importance of elemental constituents of obsidians is that mineralogical information can hardly be obtained on volcanic glasses. The non-destructive ion beam analysis (IBA) is suitable in general to determine major, minor and trace element content; therefore, IBA methods are widely used in geoscience research (RYAN, 2004), particularly in obsidian provenance studies (see for example ELEKES *et al.*, 2000).

Obsidian samples from different localities of various geological settings (Armenia, Hungary, Iceland, Mexico, Slovakia, Turkey) were analyzed by particle induced gamma-ray emission (PIGE) technique and laser ablation-inductively coupled plasma-mass spectrometry (LA-ICP-MS). Petrographically, all samples can be regarded as rhyolite according to their position in the TAS diagram. Classifying the studied obsidian samples the R1–R2 diagram (DE LA ROCHE *et al.*, 1980), where R1 = 4Si – 11(Na + K)–2(Fe + Ti) and R2 = 6Ca + 2Mg + Al, was also applied. Although it is most useful and generally used for plutonic rocks, the scheme is sufficiently general to apply to volcanic rocks, too. Samples coming from Armenia and the Tokaj Mountains belong to rhyolites. Samples from the Lipari Islands and Turkey also fall into this group, however their points are near the boundary line separating the rhyolite and alkali rhyolite fields. However, points of the samples from Iceland and Mexico are situated in the alkali rhyolite field as a consequence of their higher sodium and iron as well as lower calcium content. Obsidians are often classified chemically according to their CaO, Al_2O_3 as well as Na_2O and K_2O contents (MACDONALD *et al.*, 1993). According to this characterization, all of the analyzed samples are subalkaline–peraluminous obsidians.

Use of discrimination diagrams to classify granites according to their tectonic setting is common in the petrologic practice. Applying the Ta–Yb and Nb–Y diagrams (PEARCE *et al.*, 1984) it can be stated that samples from Hungary dominantly belonged to the field of volcanic-arc granites (VAG) as well as that of volcanic arc and syn-collisional granites (VAG + syn-COLG) as expected on the basis of their tectonic setting. Position of samples from Turkey (syn-COLG and VAG + syn-COLG, respectively) also corresponds to the expectations. Armenian obsidians are described as products of a subduction related volcanic area. Their position in the Nb-Y diagram corresponds to this fact; however, one sample can be found in the field of within-plate granites (WPG) in the Ta-Yb diagram. The sample from Lipari Islands also belongs to the WPG fields in both diagrams. On the other hand, however, these samples are close to the dividing line between WPG as well as syn-COLG and VAG fields. Both discrimination diagrams show the samples from Iceland and Mexico to belong to the WPG field. This pattern may be in connection with the alkaline character of the samples indicated by the R1–R2 diagram.

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