GEOCHEMICAL ASPECTS OF THE COUNTRY ROCKS TO THE PT-BEARING ZONED ULTRAMAFIC COMPLEX OF NIZHNY TAGIL, MIDDLE URALS

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The suture zone between the European and Siberian plate is marked by Ordovician to Devonian volcanic-sedimentary rocks which contain ophiolitic and Alaskan-type mafic-ultramafic complexes. The Pt-bearing Alaskan-type ultramafic bodies are situated at the western edge of the suture zone close to the Main Uralian Fault and run parallel to the trend of the ophiolitic complexes. The Alaskan-type Nizhny Tagil Complex (NTC) is situated in the Middle Urals, some 30 km SSW of Nizhny Tagil and consists of a dunite core surrounded by clinopyroxenite. The ultramafic rocks are enclosed in strongly foliated gabbroids with a decreasing intensity of foliation to the east.

Two types of gabbros can be distinguished within the suture zone of the Urals according to their Sr-content. Gabbros with low Sr-content (100–300 ppm) are associated with the ophiolitic ultramafic complexes, whereas high-Sr gabbros (400–1000 ppm) occur related to the Alaskan-type complexes of the Urals (EFIMOV et al., 1984). Both types of gabbroids occur as country rocks to the ultramafic core of the NTC. Low-Sr gabbroids (170–240 ppm) are situated east of the ultramafic rocks and high-Sr gabbroids (440–850 ppm) occur east of the low-Sr gabbroids as well as in smaller occurrences west of the ultramafic rocks.

The low-Sr gabbroids cluster within the MORB and N-type MORB fields of standard discrimination diagrams. The rocks are characterised by flat REE patterns (normalised to C1) with signatures diagnostic for MORBs (Fig. 1a).

The high-Sr gabbroids show a more scattered distribution clustering in the vicinity of the island-arc basalt, calc-alkaline basalt and volcanic-arc tholeiite fields, respectively, in different standard discrimination plots. However, the REE patterns are far more informative and suggest the distinction of two different types of non-MORB gabbroids (Fig. 1b). The first type is characterised by elevated LREE contents (Fig. 1b) closely resembling calc-alkaline island arc basalts. The second type shows less pronounced LREE-enrichment and thus an affinity to island arc tholeiitic basalts (Fig. 1b). However, both types of non-MORB gabbroids display similarly elevated levels of Ba, K, Sr and low abundances of Nb, Zr, Ti, and Y when normalised to N-type MORB (Fig. 1c). The trace element patterns of the Uralian gabbroids correspond closely to the pattern of calc-alkaline island arc basalts as given by Sun (1980).

These preliminary geochemical results suggest that at least three different types of macroscopically similar gabbroids can be distinguished in the immediate vicinity of the

ultramafic rocks of the NTC. Affinities to both, MORB and island arc signatures occur in close spatial association. Forthcoming investigations will aim to distinguish whether an undisturbed primary magmatic setting can explain this unusual association. Alternatively it is envisaged that collisional tectonic processes, probably in a transpressional regime, have led to the emplacement of the ultramafic rocks and the surrounding gabbroic units.

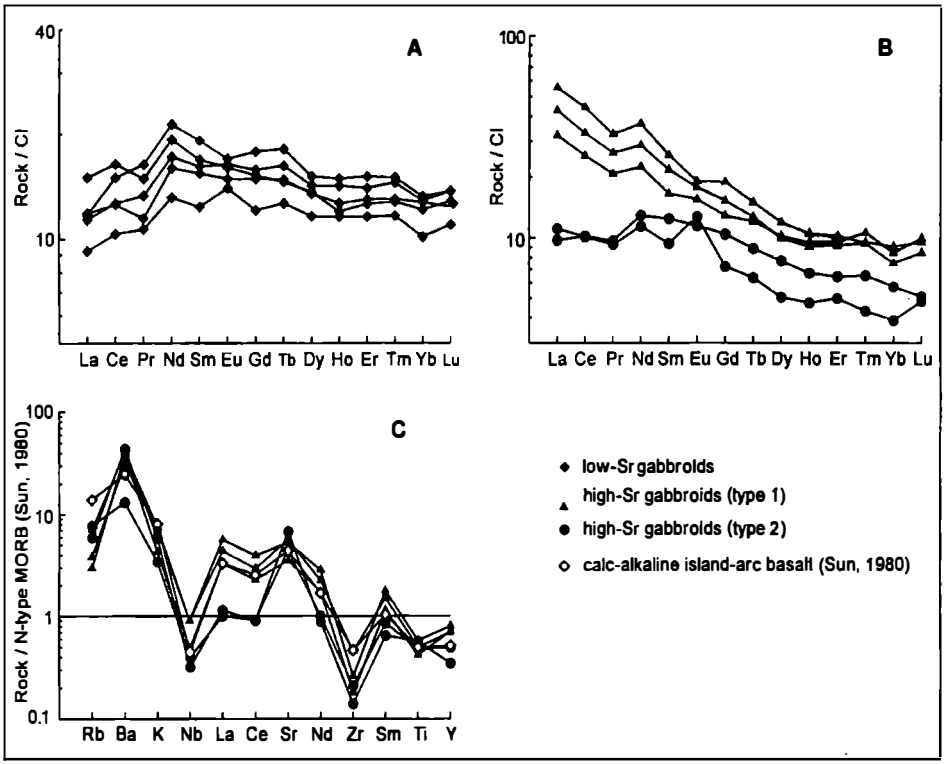

Fig. 1:
(a) C1-normalised REE patterns for NTC low-Sr gabbroids. (b) C1-normalised REE patterns for NTC high-Sr gabbroids. (c) MORB-normalised trace element patterns for NTC high-Sr gabbroids (MORB of Sun, 1980).

SUN, S.-S. (1980): Lead isotopic study of young volcanic rocks from mid-ocean ridges, ocean islands and island arcs. - Phil Trans R. Soc. Lond., A297, 409–445.

EFIMOV, A.A., MAYEGOV, V.I., FLEROVA, K.V., YAKOVLEVA, O.M. (1984): Strontium in Ural gabbro-hyperbasite complexes. - Geokhimiya, 7, 971–984 (English translation 1985).