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'Serdobol granite' in Saint Petersburg: A provenance analysis

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A group of decorative stones known as 'Serdobol granite' includes various rock types. They were mined since the 18th century in the Sortavala (Serdobol) region of Southern Karelia (Russia). The maximum popularity of Serdobol granite as carving and building stone was reached between 1800-1860 in Saint Petersburg and surroundings and in the time span between 1900-1915 in the town of Sortavala and adjacent territories. The most famous example of usage of Serdobol granites is the New Hermitage in Saint Petersburg (1842-1851). More than 50 massive columns in halls and 10 figures of atlantes supporting the balcony of the Southern facade together with numerous other details are executed of Serdobol granite.

In fact, the term 'Serdobol granite' as it was used in the numerous works dealing with architecture and history does not correspond to a simple geological definition. Building stones described as 'Serdobol granites' can be magmatic (from felsic to mafic) or metamorphic rocks. They are dark-colored (predominantly gray to dark-gray), hard, solid and durable. Most rocks of this type deposited in the Sortavala region belong to the Lauvatsaari-Impiniemy series of early orogenic, small intrusive massifs localized in paragneisses of the Ladoga series. In the current work we use the term 'Serdobol granite' according to this definition.

'Serdobol granite' used in monuments of Saint Petersburg reveals distinct textural, structural, and mineralogical variations. Even among the ten sculptures of atlantes (telamones) of the New Hermitage, at least four different rock types can be recognized.

We have collected samples of 'Serdobol granite' from the most important historical quarries near Sortavala: Tulolansaari island (main quarry and Ruotsenkallio quarries), Impiniemi cape, Riekkalansaari island, and Vannisensaari island. To establish key differences between studied types of 'Serdobol granite', the following rock properties were considered: (1) macro-scale coloration, (2) macro-scale texture and structure, (3) main and accessory minerals in thin sections, (4) major and minor element chemistry defined by XRF, ICP, (5) structural and textural properties on microscale, and (6) mineral chemistry obtained by EPMA.

The main rock-forming minerals are quartz, felsic plagioclase, K-feldspar and biotite in all rock types. The mineral and whole rock composition corresponds to granite to granodiorite. Indicative accessory minerals are hornblende, allanite, iron sulfides, rutile, ilmenite, REE-F-carbonates, and Ba-rich K-feldspar. Some structural and textural markers may be used to distinguish different types of the 'Serdobol granite' like epidote overgrowths on allanite, large separate biotite crystals, mosaic aggregations of quartz grains, and corrosion of biotite.

The indicative peculiarities of 'Serdobol granite' revealed can be used for a quick classification and provenance analysis even when only small or no rock samples from architectural monuments are available.