On the petrographical textures by means of the algebraical Quadratic Form Theory

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It was A. Harker who noted in his Petrology (1895) that rocks of different types are often connected by insensible gradations, so that any artificial classification with sharp divisional lines can not truly represent the facts of nature. What we suggest in the paper is an algebraical algorithm to solve this dilemma.

Physical reasons force the following intermineral relations in a rock. Four grains contact each other in a point, three grains meet at the edge while two grains are in contact at the surface. The appropriate statistics may be denoted as p_{ijkl} , p_{ijk} and p_{ij} . And the surfaces $p^{ijkl}\, m_i\, m_j\, m_k\, m_l = 1$, $p^{ijk}\, m_i\, m_j\, m_k = 1$, $p^{ij}\, m_i\, m_j = 1$(in Einstein's notation) may be built. These are textural indicatrices of rocks. We unite in one type those and only those petrographical textures which relate to the indicatrices of the same topology. This approach has adjusted well the insensible gradations between the rocks in respect of the p_{ijkl} , p_{ijk} and p_{ij} probabilities to discrete divisional lines between them.

It is expedient to base rock classification on the p_{ijkl} statistics because the other two follow from it. But it can not be calculated even in the 2D section of a rock. As for p_{ijk} and p_{ij} statistics, they can be found under the microscope and then reconstructed to 3D. Another problem is that algebraical theory is getting highly complicated when using p_{ijkl} and p_{ijk} statistics.

The above theory is developed for p_{ij} statistics up to now. It is applyed to distinguish between the monotonous varieties of norites and gabbronorites of the PGE-bearing Pansky massif, Kola Peninsula, Russia.