P33-MO

# ORGANIC MATTER AT METAMORPHIC LEVEL

Natalia P. FADEEVA

*Lomonosov Moscow State University*

Organic matter (OM) on different catagenetic stages is studied sufficiently well. Although there are much less works devoted to investigation of OM of the sedimentary rocks being on high transformation levels nowadays – in apocatagenesis and metagenesis. During catagenesis forming of gaseous and liquid HC`s and non-HC products is taking place. Loss of functional groups, radical reconstruction of initial matrix of kerogen is accompanied by coalification, aromatization and condensation consolidation of the main part of OM and, as a result, its graphitization. However received material showed that kerogen molecule obtains hydrogen atoms and heteroelements even on high stages of lithogenesis, so full graphitization of OM does not occur.

Object of our investigation has been dispersed OM of Permian and Triassic terrestrial rocks of some Eastern Saha ore deposits. Studied rocks are represented by sandstones, siltstones, shales and garnet-biotite gneiss. They are variously transformed as a result of regional metamorphism – from apocatagenesis till green slate and amphibolite metamorphic stages; following imposition of hydrothermal processes caused insignificant transformation of OM as a result of additional warming.

Complex of investigations included determination of TOC content, bituminological analysis, kerogen separation with determination of its elemental composition, rock and kerogen pyrolysis by Rock-Eval.

By pyrolysis data most reliable values of Tmax=469-626$^{o}$C. High transformation level of OM allows comparing analytical data of TOC content with kerogen as a whole. Residual OM is present in the rocks even on high transformation levels, its content in the studied rocks varies in wide ranges from 0,2 up to 2,4%, i.e. full loss of OM mass does not occur even on stage of metagenesis.

Second peculiarity of highly transformed rocks consists in retaining of close correlation between its lithological composition and content of OM; this connection does not break even in the zones of different effect of hydrothermal processes on the rocks. Average TOC content in sandstones is 0,43%, in siltstones – 1%, in silty claystones – 1,4%. This dependence is stipulated by syngenetic character of residual OM in highly transformed rocks.

By elemental composition kerogen data of the lowermost part of apocatagenetic stage high content of C=81,01-89,87% and heteroelements – 8,23-15,7% and low of H=0,88-3,29% is marked out. H/Cat is 0,18, following increasing of C up to 90,3-96% and markable (2 times) lowering of H (up to 0,9-1,45%) and heteroelements (up to 3-8%), H/Cat - 0,12 within the zone of mezocatagenesis. There is a tendency of hydrogen content increasing in the elemental composition of kerogen at lowering of TOC in the rock (it is marked out for the rocks of lower and higher transformation levels). This relation coincides with a famous statistic regularity showing that at lowering of OM concentrations its sapropelic part (i.e. lipid content) is increasing.

OM is fully deprived of its source potential – bitumen are practically absent (traces). Low quantity of free HC`s in adsorbed condition on the surface of organic-mineral mass is determined by pyrolysis data: $S_1$ < 0,04 kg/t, at that the same tendency as for OM is revealed: outlet of HC`s from the claystones is higher than from siltstones and sandstones. The same direction is marked out in the changes of genetic potential ($S_1$+$S_2$) whose values do not exceed 0,08 kg HC/t rock. HI is extremely low – 3-13 mg HC/g TOC.

Obtained data show that high transformation level of Paleozoic-Mezozoic rocks of Eastern Saha region has stipulated full exhaustion of the source rock potential; however in spite of approaching to the graphitic structure full coalification of kerogen did not occur. By analogy with the coal micromolecule structure block-molecule of kerogen is 75-80% represented by C atoms assembled onto the packages from layers of condensed aromatic nucleus. Hydrogen, oxygen, sulfur and some metals (gold, silver and the others) are included into the kerogen grate. This stiff structure is remaining in extreme conditions and is being the final transformation form of dispersed OM.