Carbon isotopes and microelements distribution in fractions of brown coals

A.N. PYRYAEV*, V.A. PONOMARCHUK AND D.V. SEMENOVA

Institute of Geology and Mineralogy, 630090, ac. Koptuga st. 3., Novosibirsk (*correspondence: pyrayev@gmail.com)

Pyrolysis of coals [1, 2 etc] and element emission in a coal combustion process [3 etc] has been extensively investigated in many studies. Unfortunately, isotopic and microelement composition of extracted coal fractions and relationship of this parameters was not investigated carefully.

Pyrolysis (500°C) of three brown coals (1, 2 and 3) of varying R_{vt}^{0} (0.77, 0.49 and 0.41 %, respectively) have been carried out in close isothermal vacuum (5 millibar) system. Two/tree fractions of pyrolized coals were collected: A - transparent high-volatile distillate; B - viscous oligomeric (probably) distillate; C - ash that remains after pyrolysis of coal. Yield of the distillates (25-70 wt. %) depends on coal type. Carbon isotope composition were determined using Thermo Finnigan 253 mass spectrometer and GasBanch. Difference in isotopic composition of fractions of one coal reaches 5.4 ‰.

Pyrolysis of coals lead to partial transfer of microelements from a coals to a distillates. Microelemental composition (25 elements) of initial coals and they fractions were determined using SR-XRD-analysis. Microelement content in distillates decreases from 1100 ppm (Ca) to 0.4 ppm (Y). Such microelements as V, Nb, Th and U was not transferred at all. Some microelements were transfered to a distillates almost totally (Pb, As, Zn).

The major conclusions: 1 - vacuum pyrolysis of brown coals lead to decompostion of coals in distillates and ash that differs in carbon isotopic compositions; 2 - distillates contains some microelements and may be considered as transfer agents of microelements in coals. This point is able to explain formation of polymetallic ores in the neighborhood of coal basin; 4 - it may be suggested occurene of correlation between isotopic and microelemental composition of coal fractions.

[1] Senneca, Uriciolo, Chirone & Cumbo (2011) *Fuel* **90**, 2931-2938; [2] Krzesinska, Szeluga, Czajkowska, Muszynski, Zachariasz, Pusz, Kwiecinska, Koszorek & Pilawa (2009) *Int. J. of Coal Geol.* **77**, 350-355; [3] Xu, Yan, Zheng, Qiao, Han & Sheng (2003) *Fuel Processing Technology* **85**, 215-237.

Polymetamorphic complexes of the Urals as indicators of formation of the Ural part of the East European Craton

A. M. PYSTIN

Institute of Geology KSC UB RAS, Syktyvkar, Russia,Syktyvkar State University pystin@geo.komisc.ru

Archean and Paleoproterozoic formations are known in the section of the Ural Lower Precambrian. They are high-temperature and complicatedly dislocated polymetamorphic complexes. There are enough strong reasons to interpret these complexes as tectonically displaced fragments of the crystalline basement, adjacent to the west of the platform.

The lowest age of metamorphic processes in granulite complexes (gneiss-granulite and granulite-metabasite) is limited by 2.8-2.7 Ga. Dynamic regimes of this metamorphic phase varied from moderate (gneiss-granulite complexes) to relatively high (above 10 kbar, granulite-metabasite complexes). Considering the various material composition of granulites of different pressure, we can assume that they were formed in Wilson’s cycle.

Gneiss-migmatite complexes were formed under sequential manifestations of the granulite metamorphism which was replaced by the amphibolite facies metamorphism of moderate pressures and accompanying granitization. The lowest age limit of this metamorphic stage is ca. 2.1 Ga. The time of the amphibolite facies metamorphism in the gneiss-migmatite complexes is estimated as 1.95-1.75 Ma.

Eclogite-gneiss and eclogite-schist complexes, obviously, also belong to the Lower Proterozoic. Eclogite formation could take place synchronously with the granulite metamorphism, ca. 2.1 Ga in the lowest age.

Thus, it is reasonable to assume that in the Early Proterozoic metamorphic processes occurred under sharply different dynamic conditions, typical of subduction-collision systems.

The evolution of ultra-high-temperature and high-pressure metamorphic processes in the Ural polymetamorphic complexes generally correlates with the metamorphic development of the Early Precambrian complexes, adjacent to the west of the platform area. Thus, accretion-collision complexes formed 2.88 to 2.58 Ga in the Fennoscandian Shield (Fennoscandia) were revealed. The granulite and eclogite metamorphism correlates in time with uniting of Volga-Ural region and Sarmatia (ca. 2.1 Ga), and more recent amphibolite facies metamorphism and associated granitization - with merging of these two megablocks and Fennoscandia (1.8-1.7 Ga).

The work was supported by the Program of Basic Researches of RAS № 12-I-5-2022.

DOI:10.1180/minmag.2013.077.5.16