

PETROLOGY AND METAMORPHIC EVOLUTION OF DIAMONDIFEROUS METASEDIMENTARY ROCKS FROM THE KOKCHETAV MASSIF, N. KAZAKHSTAN

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The Kokchetav massif occupies a key position in one of the largest suture zones in Eurasia. This area is well known as the type locality of diamondiferous meta sedimentary rocks. These rocks are represented by dominant quartzofeldspathic gneisses, sometimes rich in biotite and zoisite with subordinate garnet, pyroxene, quartz and carbonate-bearing garnet-pyroxene rocks including dolomitic marbles, which are sometimes very rich in diamonds (more than 1000 carats per metric ton). Microdiamond crystals of variable morphology and size mostly from 2 to 50 micrometers are present as inclusions in garnet, zircon, pyroxene, kyanite and in secondary mineral aggregates replacing garnets and pyroxenes. Coesite inclusions in zircon and garnet are detected in diamondiferous rocks and in nondiamondiferous eclogites and whiteschists. Very wide range in Mg# reaching 80-90 is typical of Ca-rich (Ca# 45-80) garnets from carbonate bearing rocks. These unusual features along with abundance of Na-bearing garnets in gneisses (up to 0.2wt% Na₂O), K-rich pyroxenes (up to 1.5wt% K₂O), Al-titanite and rutile (up to 13.8 and 0.4wt% Al₂O₃ respectively), Si-rich phengites attest to ultrahigh pressure conditions of metamorphism. Complex garnet zonation and wide compositional variations of garnet inclusions from zircons of some samples provide an evidence of a wide temperature interval at the prograde path of metamorphism. Diamond size and properties indicate a rapid growth which is probably related to a short period of ultrahigh pressure metamorphism and a superfast exhumation.