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Geological Features and Ore Genesis of the Ondor Sum Deposit

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The Ondor Sum deposit, a large, low-grade iron ore deposit, occurs in the upper Proterozoic metavolcanic-sedimentary sequences of the Ondor Sum Group in south-central Inner Mongolia. The Ondor Sum Group consists mainly of metabasaltic rock, greenschist, marble, finely crystalline quartzite, and related metachemical sediments. Most of the iron ore occurs as stratiform and podiform deposits, or as massive lenses, along the transition zone of greenschist, chlorite-biotite-sericite-albite-quartz rocks, or calcite-amphibole-albite-quartz rocks. Two important ore types, chlorite-magnetite and calcite-magnetite, have been recognized and are interpreted as forming from different ore fluids. Primary mineralization in the deposit consists of martite and magnetite, with minor amounts of specularite, goethite, and limonite.

Upper Proterozoic and lower Paleozoic iron ore deposits and prospects along the northern margin of the Sino-Korean paraplatform in south-central Inner Mongolia, China, are well developed, from Bayan Obo in the west to the Bailinzhouqi region in the east. Among them, the Ondor Sum iron ore deposit is the largest. Regional geologic mapping and mineral evaluation of iron prospects in the Ondor Sum district were performed by Gological Party No. 208 of the Inner Mongolian Bureau of Geology and Mineral Resources (IMBGMR) during 1058-1960. A systematic diamond drilling program was carried out by several geological parties of IMBGMR between 1975 and 1980. About 25 million tons of iron ore were found in 11 locations, with a total Fe content ranging from 25 to 50%. The iron ores, together with other copper, gold, and lead mineralization in the Ondor Sum district and neighboring Bainaimiao area, constitutes an important part of northern China's metallogenic belt. Proterozoic and lower Paleozoic mafic volcanosedimentary sequences are the most common host rocks for the iron and other ore deposits and prospects in the Ondor Sum district and neighboring Bainaimiao area. The volcanosedimentary rocks have been extensively metamorphosed and deformed. The ages and genesis for these ore deposits and prospects are poorly understood, and the relationship of the greenschist, metasediments, and iron mineralization is controversial.

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Iron mineralization in the Ondor Sum district was previously considered to be a product of regional metamorphism and metasomatism of iron-bearing volcansedimentary sequences of the Ondor Sum Group during the Caledonian orogeny. Other studies indicate that the iron deposits and prospects were produced by an Early Paleozoic mafic volcanic eruption and related metasomatism. Based on detailed geologic and geochemical studies, Nie (1991) suggested that the ore-forming process of the Ondor Sum iron deposits was related to Late Proterozoic submarine volcanism, sedimentation, and alteration. The ore fluids were mainly derived from mixed sources of mafic volcanic and granophyre-exsolved solution, as well as sea water.

The Ondor Sum district and neighboring Bainaimiao area constitute a tectonic zone, trending E-W to SW-NE, 130-160 km in length and 30-50 km wide. It developed along a subduction zone of the Precambrian continent and Paleozoic fold belt, and can be divided into the Sino-Korean paraplatform to the south and the ancient Mongolian oceanic volcanosedimentary sequences to the north. The two parts are separated by the Xuniwusu deep crustal fault. Another deep-seated fracture is the NE-trending Ondor Sum fault. The two faults not only form boundaries of various tectono-stratigraphic units, but also provide a channel for magma intrusions. It has been suggested that paleotectonically, the district belongs to a trench and island arc terrain, which was accreted onto the Sino-Korean paraplatform.

The Ondor Sum Group mainly refers to the area located at the east of Jining–Erlian railway lines, Zhurihe and its northern part. The group outcrops a middle - shallow marine facies metamorphic volcanic sedimentary rocks. The rock formations occurrences The Ondor Sum type Iron Ore, non-ophiolite sequence of high-pressure metamorphic mineral assemblages and geological community which concerned at home and abroad, and has been used as an important indicator of Early Paleozoic trench.

The Ondor Sum-Bainaimiao area is an elongated zone of uplift and depression, 130 to 160 km long and 30 to 50 km wide oriented E to NE. The tectonic belt, developed on an ancient continent margin, can be divided into two parts

separated by the Chuanjing-Huade deep crustal fault: (1) the Sino-Korean platform to the south, and (2) the ancient Mongolian oceanic volcano-sedimentary sequence to the north. It has been subjected to mulriple episodes of subduction and collision related to movement of the ancient Mongolian oceanic plate under the Sino-Korean platform. Various tectono-stratigraphic units exhibit a superposition with complex structural patterns.

The establishment and development of plate tectonic theory promotes the progress of geological sciences, and it makes full use of the other geological discipline theory. On the basis of geological theory, the earth crust will be divided into a number of tectonic units, which made a successful global structure of the earth's crust. The Ondor Sum – Bainaimiao Area is on the global tectonic Paleo-Asian ocean plate and Sino-Korean plate convergence, namely the Inner Mongolia axis and Inner Mongolia borders of Paleozoic geosyncline of traditional geology. This is reason of the complex geological structure, frequent magmatic activity and the mineral-rich. Also it is the inner factors of the typical ophiolite suite and double metamorphic belts.

The Ondor Sum Group belongs to Paleo-Asian ocean deep-sea sediment, mainly consists of the oceanic tholeiite, pillow chlorite spilite and radiolarian siliceous rocks. From top to bottom the group is divided into three rock groups, the six sections, and the total thickness is more than 1800 meters.

(1) The Laiyinhuduge Group

The group mainly consists of the oceanic tholeiite, chlorite spilite sheet, diabase dike, the upper clip iron ore layer. Oceanic tholeiite pillow structure development.

The group consists of two rock sections, but no obvious boundaries. It is general located with diabase - sheet rock wall, the open section of rock called the bottom rock section, pillow lava called the upper rock section. The metamorphic rocks mainly are chlorite spilite, green shade chlorite spilite, fine quality tuff, diabase, blue schist, etc. Regional metamorphism carbonate veins, quartz vein development differentiation. Plagioclase granite dike or ring spot granite dike is locally visible.

(2) The Harhada Group

The group mainly consists of iron siliceous rocks, and is divided into two rock sections:

Iron siliceous rocks at the bottom: gray quartzite, pink quartzite, quartzite, red stripes red iron (brown) iron ore layer, yellow-green metamorphic sandstone manganese iron quality, and the TB. Poor crystallization quartzite, radiolarian fossils.

Upper quartz schist: silk marble British schist, sericite chlorite quartz schist, red curtain silk marble stone the schist, clip a thin layer of quartzite, slate, phyllite.

(3) The Wulan Aobao Group

This group is a unique rock combination, consisting of the rocks which is characteristic of different ages, different lithologies and rock sizes. Rocks are generally mylonitization, silicification and carbonatization, interlayer fold and fault development. Most outcropped rocks are lithology with sericite chlorite quartz schist, silicide chlorite spilite, silicide marble, serpentinization ultrabasic rock, iron quartzite, blue schist, etc. They are mainly distributed in Monuogeqin, Aocanggou, Tulike, namely the south side of the ancient trench - deep fault belt.

The Ondor Sum - Bainaimiao bedrock exposed area, mainly belongs to the Ondor Sum Group. In the south, there is unknown age old metamorphic rocks which is exposed, mainly consists of inclined anorthosite amphibolite and anorthosite amphibolite gneiss. Sometimes serpentinization peridotite can be found, contact with the Ondor Sum Group by faults. The north and south of the Ondor Sum Group sporadically distributed carbonate of AMu mountain group.

The Ondor Sum Group mainly consists of oceanic tholeiite - chlorite spilite, diabase, iron siliceous rocks for clip serpentinization peridotite, marble, slate, phyllite; Southern old strata are mainly inclined anorthosite amphibolite, anorthosite oblique Angle of gneiss, and no diagonal anorthosite granite, granite diorite porphyry intrusion.

The Ondor Sum Group has characteristic with high degree of magmatic differentiation, both of the ultrabasic rock and basic rock are exposed, and basic rock mainly. The aluminum supersaturated rock is rare, high content of iron, magnesium, manganese, and Fe_3O_2 > FeO, low content of potassium, high calcium content, without alkaline rock.

Sonid Right Banner Paleoproterozoic south treasure group sound figure to extensional collapse phase cracking, ancient land mass in the the Ondor Sum of the Neoproterozoic - all the Ondor Sum group and occurrence in the early Paleozoic ophiolitic melange of magnesium iron rocks and basic volcanic rocks and siliceous rocks in the combination of oceanic crust represents - Neoproterozoic - disintegration of early Paleozoic epicontinental tensile stage of extensional type transition shell. At the beginning of the end of the early Paleozoic, when the tectonic system was in the transition of the tension into compression, Sonid Youqi exposed a lot of alteration diorite, tonalite, granodiorite, monzonitic granite and potassium anorthosite granite, the U - Pb zircon age was 418–326 Ma, representing island arc magma of late Paleozoic convergent stage in this area.

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