RETRACTED ARTICLE: A preliminary study on the Earth’s evolution and condensation

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ABSTRACT

Through many field geology observations, the authors find that sandstone and carbonate rocks, which were originally thought to be sedimentary, have magmatic characteristics and should classified as magmatic rather than sedimentary rocks. Combining this information with the principles of Bowen’s reaction series, the authors conclude that the Earth has evolved gradually from high temperature to low temperature and, through crystallization differentiation, has experienced the following stages: high melting point metal to ultramafic rock to mafic rock to neutral rock to acidic rock to sandstone to carbonate rock to mudstone to ice. Since fossils that preserve the remains of creatures, such as fossil fish, occur in magmatic rocks rather than sedimentary rocks, the organisms were not aquatic but lived in high-temperature fluids with magmatic characteristics. Therefore, the authors conclude that during the evolution of rocks from high temperature to low temperature, biological evolution from high temperature to low temperature also occurred on the Earth and that carbon-based life did not originate in the ocean but in high-temperature carbon-containing fluids; this is a subversive statement. This understanding contradicts the original interpretation, that is, that fossils formed under normal temperature and pressure conditions. This point explains the Cambrian explosion and later mass extinctions.

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The formation and evolution of the Earth are important research topics in natural sciences and the most basic and core scientific problems in geosciences. These topics involve the origin of life, biological evolution and changes in the future human living environment. From the end of the 18th century to the 1950s, fixism had been the main theory in this field, which can be divided into three stages: orogenic stage of vertical crustal movement; geosyncline-platform stage with contraction theory as its theoretical basis; and the stage of coexistence of fixism and mobilism (Yang, 1998 & Zhang, 1981). In 1967, Morgan, McKenzie and Le Pichon extended the seabed expansion theory and continental drift theory to the entire lithosphere and summarized and enhanced the understanding of the general laws of lithospheric movement and evolution. This theory was named plate tectonics theory or a new global tectonics theory (Erickson, 1992). Since then, plate tectonics (activity theory) has become a widely recognized theory of Earth evolution. However, there are still some important scientific problems that have not been reasonably explained, such as the reason why the Cambrian life explosion occurred. What caused mass extinctions? Was the extinction of the dinosaurs truly caused by asteroids hitting the Earth? As the Earth continues moving, what forces are driving earthquakes, volcanic eruptions, etc. (Ma, 2016)?

Through years of field work and abundant objective evidence, the authors found that sedimentary rocks, such as sandstone and carbonate rocks, were not formed by sedimentation but had the characteristics of magmatic rocks. Therefore, a theory of the condensation evolution of the Earth was proposed. According to this theory, some important scientific issues, such as the Cambrian explosion and later mass extinctions, can be reasonably explained.

Magmatic characteristics of sandstone

The genesis and formation environments of rocks are closely related to geological evolution, and accurately determining these processes is very important. According to the genesis of rocks, they can be classified into three types: magmatic rock or igneous rock, sedimentary rock and metamorphic rock (Yu et al., 2012). According to this genetic classification, sandstone and carbonate are typical sedimentary rocks. However, the authors have found much evidence in the field to indicate that sandstone has the characteristics of magmatic rocks. Figure 1 shows the gravel-bearing sandstone of the Liangjiehe Formation on the southeastern margin of the Yangtze Platform in Tongren city, Guizhou Province, which contains dolomite xenoliths. Generally, we see dark mafic and ultramafic xenoliths in many granites, which are usually
considered wall rock fragments captured by the later granitic intrusives during the intrusion process. The dolomite xenoliths in the sandstone prove that the sandstone is a magmatic rock and captured the earlier dolomite during the intrusion process. The typical phenomena of plagioclase feldspar in quartz (Figure 2(a)), polycrystalline quartz and worm-like quartz (Figure 2(b,c)) can be observed under the microscope. These observations indicate that quartz is not formed by sedimentation but formed automatically in a high-temperature liquid state. Some typical accessory minerals in igneous rocks, such as apatite (Figure 2(d)) and tourmaline, are also found in sandstone. These phenomena sufficiently indicate that the sandstone should be considered magmatic.

Isotopic data show (Zhou et al., 2007) that the values of δ^{13}C in dolomite from the Liangjiehe Formation range from \(-2.19\)% to \(-2.86\)%o, with a mean value of \(-2.65\)%o. The δ^{13}C values of the dolomite in the bottom gravel-bearing sandstone vary between \(-2.67\)%o and \(-1.78\)%o, indicating that this dolomite may be either a normal marine carbonate rock or a mantle-derived igneous rock. Combining the geological characteristics in the field and under the microscope, the authors conclude that the dolomite is of igneous origin.

Figure 1. Contact relationship between sandstone and dolomite, Datangpo manganese mine, Tongren, Guizhou Province.

Figure 2. Photomicrographs of sandstones from the Liangjiehe Formation in the Datangpo manganese mine area (a, b, c: cross-polarized light and d: plane-polarized light).
Figure 3 shows the quartz sandstone of the Changzhougou Formation from the Middle Great Wall Period in the North China Platform Plate of Zunhua, Hebei Province. The late-stage light white quartz sandstone, which is obviously characteristic of magmatic intrusion, intruded into the yellowish quartz sandstone of the early stage and cut off the early-formed joints (previously identified as bedding). The typical phenomena of polycrystalline quartz (Figure 4(a)), wedge-shaped quartz and hook-like quartz (Figure 4(b,c)) are also found in the late-stage quartz sandstone. The irregular edges of wedge-shaped and hooked quartz grains coincide with the edges of surrounding quartz grains, indicating that these are paragenetic minerals rather than the products of long-distance transport and abrasion. Some typical accessory minerals of igneous rocks, such as tourmaline, are also found, proving that the rock is a magmatic rock. The early quartz sandstone also has typical phenomena, such as polycrystalline quartz,
worm-like quartz and volcanic accessory minerals (Figure 5), which shows that the quartz sandstone has magmatic characteristics.

In addition, on the southeastern margin of the Yangtze Platform, green clayey siltstone can be observed penetrating the red iron-bearing clayey siltstone of the Neoproterozoic Banxi Group along joints in the No. 518 mining tunnel of the Yufeng mining area, Minle manganese mine, Huayuan County, Hunan Province (Figure 6). Examination under the microscope shows that the components of both rocks are similar, which proves that the green clayey sandstone, which had been liquid, was injected similar to quartz veins and calcite veins in the form of hydrothermal deposits. Again, these observations have proven that sandstone has magmatic characteristics.

These typical geological phenomena observed in the North China Platform and Yangtze Platform prove that sandstones may not be formed by sedimentation but have magmatic characteristics. In addition, sandstone has compositional continuity with magmatic rocks. Magmatic rocks are usually classified into four types according to SiO₂ content: ultramafic rocks (SiO₂ < 45%), mafic rocks (SiO₂ 45% – 53%), neutral rocks (SiO₂ 53–66%) and acidic rocks (SiO₂ > 66%). According to Best (2003), among magmatic rocks, rhyolite has the highest SiO₂ content (73.95%), while siliceous rocks with higher SiO₂ content (SiO₂ 70–99%), quartz sandstone and feldspathic sandstone are considered sedimentary rocks, which may be a mistake.

The main mineral components of sandstone are quartz, feldspar and debris. Three common sandstones are quartz sandstone, feldspathic sandstone and greywacke. In quartz sandstone, the quartz grain content is more than 90%; in feldspathic sandstone, the feldspar content is more than 25%, while the remainder consists mainly of quartz and some debris (the main mineral components of rhyolite are quartz and feldspar); greywacke contains more fine-grained groundmass and is composed of chlorite, sericite, silt-sized quartz and feldspar grains. Greywacke often looks like diabase because of its dark grey or black colour (Yu & Mei, 2016). The content of SiO₂ in feldspathic sandstone is usually more than 70% (Table 1). Compared with rhyolite, the mineral composition is similar. The contents of Fe and Al are lower, while those of Ca and Mg are higher.

Based on field geological phenomena and laboratory research results, the high-silica rocks originally...
considered sedimentary rocks, such as feldspathic sandstone and quartz sandstone, are inferred to be magmatic rocks. Combining this information with Bowen’s reaction series, magmatic rocks should continue to crystallize beyond rhyolite. However, due to the limitations in Bowen’s time, he did not use feldspathic sandstone and quartz sandstone as experimental components. If sandstone is a magmatic rock as the product of late crystallization differentiation, is there any evidence from geological phenomena in the field? The answer is affirmative. On the lithology-structure profile of the second member of the Upper Triassic Tumugou Formation in Shangrila, Yunnan Province, the transitional relationship between quartz dioritic porphyry and sandstone is evident, which proves that the inference is correct.

Magmatic characteristics of carbonate rocks

Since sandstones should be assigned to magmatic rocks, what are the carbonate rocks that are defined as typical sedimentary rocks? Carbonate rocks, such as limestone and dolomite, show transitional relationships with certain sandstones, and conformable contacts are also very common in various places. Within the section of the middle-upper Proterozoic Jixian Group (Bureau of Geology and Mineral Resources of Hubei Province, 1982), the 30th layer of the second member of the Tuanshanzi Formation is mainly pur-

Table 1. Table showing contrasts in main chemical constituents of different rocks.

| Composition       | Quartz sandstone (Pettijohn et al., 1987) | Feldspathic sandstone (Pettijohn et al., 1987) | Greywacke (Pettijohn et al., 1987) | Granodiorite (Best, 2003) | Granite (Best, 2003) | Rhyolite (Best, 2003) |
|-------------------|------------------------------------------|-----------------------------------------------|---------------------------------|--------------------------|-------------------|-------------------|
| SiO₂              | 95.4                                     | 77.1                                          | 66.7                            | 66.91                    | 71.84             | 73.95             |
| Al₂O₃             | 1.1                                      | 8.7                                           | 13.5                            | 15.92                    | 14.43             | 13.48             |
| Fe₂O₃             | 0.4                                      | 1.5                                           | 1.6                             | 1.40                     | 1.22              | 1.50              |
| FeO               | 0.2                                      | 0.7                                           | 3.5                             | 2.76                     | 1.65              | 1.13              |
| MgO               | 0.1                                      | 0.5                                           | 2.1                             | 1.76                     | 0.72              | 0.40              |
| CaO               | 1.6                                      | 2.7                                           | 2.5                             | 3.88                     | 1.85              | 1.16              |
| Na₂O              | 0.1                                      | 1.5                                           | 2.9                             | 3.80                     | 3.71              | 3.61              |
| K₂O               | 0.2                                      | 2.8                                           | 2.0                             | 2.76                     | 4.10              | 4.37              |
| TiO₂              | 0.2                                      | 0.3                                           | 0.6                             | 0.55                     | 0.31              | 0.28              |

Figure 7. Gold Nail section in Paibi, western Hunan Province, China.
rocks (Figure 9). Sericites are discovered under the microscope in carbonate strips (Figure 8(a)). Carbonate rocks, as a rule, are considered to be chemically deposited. As a silicate mineral, sericite is almost impossible to form with carbonate rock at the same time. More likely, a mixed liquid contained carbonate components and siltstone components that grew together under certain temperature and pressure conditions. These geological phenomena indicate that carbonate rocks are not sedimentary but have magmatic characteristics and should be classified as magmatic rocks. Zuo et al. (2008) conducted C and O isotope tests on the third series of Cambrian carbonate rocks in the Chinese Paibi Gold Nail section (Zuo et al., 2008). The $\delta^{18}O$ values are negative: – 4.0–12.0‰ (the $\delta^{18}O$ values of normal marine sedimentary metamorphic rocks and carbonate rocks are between 15‰ and 29‰), which can be considered hydrothermal characteristics. Compared with the $\delta^{18}O$ of modern marine carbonate rocks, O isotope fractionation is greater than 20‰. Not only source effects (the low $\delta^{18}O$ value of the early ocean) or chemical deposition but also the isotope fractionation effect of carbonate precipitated under high-temperature to low-temperature conditions should be considered. The latter is more likely to produce significant negative values of $\delta^{18}O$ (i.e., during precipitation at high, medium and low temperatures, fractionation leads to negative $\delta^{18}O$ values).

The origin of fossils

If sandstone and carbonate rocks are of magmatic origin, an inevitable question arises: How can we explain the origin of fossils? Most of the fossils in the world occur in carbonate rocks, mudstones and shale, rarely in sandstones, and almost never in magmatic rocks.

For the sake of discussion, two fossil categories are defined in this paper: skeleton fossils and complete fossils. Skeleton fossils, such as fossil dinosaur bones, refer to non-decomposing biological skeletons that undergo a long period of corrosion after the death of the organism. It is easy to explain how this kind of fossil developed. Complete fossils refer to those formed from the intact body of living things. The formation of such fossils is generally explained by rapid burial. According to the point of sedimentology, compaction is indispensable for consolidation. It is difficult to imagine that fossils undergoing a long period of geological compaction can preserve the initial features of the organism after rapid burial. This explanation seems to be somewhat implausible.

Conclusions were drawn based on many field geological observations. Carbonate rocks and mudstones with fossils are not sedimentary rocks but have the characteristics of magmatic rocks. Therefore, the conclusion is that some extimate fossils were formed through rapid coagulation while they were still living in a liquid, similar to fish frozen in ice. Based on this inference, a significant scientific conclusion could be drawn that the carbon-based organisms on Earth did not originate from the ocean but from high-temperature carbon-bearing fluids. This point contradicts the original interpretation, that is, that fossils represent creatures that lived under the current temperature and pressure conditions.

In a famous palaeontological site of the United States, the Green River Group, researchers from Arizona State University and the Japanese Paddy Memorial Hall discovered a large piece of limestone with fossils including 259 small fish (Figure 10). As shown in the Royal Society of Association B, this fossiliferous piece is 0.57 metres long and 0.38 metres wide. These fish are frozen in the state of swimming in groups. This fossil specimen powerfully proves that limestone was rapidly coagulated from the liquid state, so that small active fish were “frozen” in the limestone.

Condensation evolution of the Earth

If sandstones and carbonate rocks are not sedimentary rocks but magmatic rocks, how did they form? How

![Figure 8](image-url)
did the Earth evolve? Humans have never stopped exploring the evolution of the Earth. The “dispute between water and fire” on the origin of rocks and strata was an important debate from the late 18th century to the early 19th century. A.G. Werner, from Germany, was the representative of neptunism, and J. Hutton, from Britain, was the representative of plutonism. This controversy ended with the failure of neptunism (He & Xu, 2010a, 2010b; Zhang et al., 1984).

Canadian geologist Bowen (1928) drew important conclusions through experiments. During the cooling process of magma, mafic minerals, such as olivine and pyroxene, easily crystallized first, while other minerals, such as quartz and mica, tended to crystallize later due to their lower melting points (Figure 11).

Based on the results of previous studies (Dana, 1873a, 1873b; Oldroyd, 1996; Conte, 1872; Dutton, 1892) combined with observations from many years of field geological research, the authors concluded that in the early stage, the Earth was present as a high-temperature molten mass. In space, the Earth is an open cooling system, and the distance between the Earth and the Sun is constantly increasing (Liu, 2009). The heat inside the Earth is continuously emitted through volcanic eruptions and earthquakes; therefore, the Earth is gradually cooling. During the cooling process, metals with high melting points and high density crystallized first and were enriched towards the centre of the Earth; as the temperature decreased, an evolutionary sequence formed as follows: ultramafic rock → mafic rock → neutral rock → acid rock → sandstone → carbonate rock → mudstone → ice. During this procedure, many transitional rocks, such as dolomitic sandstone and skarn, were formed, and some metallic minerals also precipitated. This basic evolutionary series is proposed based on temperature as a major factor. In fact, other factors such as solubility and pressure were involved for different minerals. Therefore, the whole evolutionary process was very complicated physically and chemically.

In the early stage of the Earth’s evolution, as the temperature decreased, metals with high density and high melting points were first enriched in the Earth’s core; then, the ultramafic and mafic stable blocks began to emerge. The initial blocks, like an egg flower floating in boiling water, drifted constantly under the action of boiling magma, became increasingly large, and finally formed an early oceanic shell. As the temperature continued to decrease, the oceanic crust was enlarged constantly, and the active magmatic composition between different oceanic crusts began to change. The result was that ultramafic and mafic components were relatively reduced, neutral and acidic rocks started to appear, and the preliminary global crust formed. As the temperature continued to decrease, sandstone began to appear. The oceanic crust was relatively stable at this time, and the original continental crust in the plastic state ascended between the oceanic crusts with some high-temperature fluids. The original continental crust was not stable in this moment, and the magma under the crust was ejected constantly. The physical and chemical reactions between the atmosphere, mainly composed of vapor and carbon dioxide, and high-temperature fluid were enhanced, high-temperature carbon-bearing fluid developed, and carbon-based creatures marked the Earth.

![Figure 9. Core from borehole Zk001 in the Tongren area, Guizhou Province, China.](image1)

![Figure 10. Small fish fossils in the Green River Group (Mizumoto et al., 2019)](image2)
a major event in Earth history. As the temperature decreased, carbonate rocks formed, and fossils were generated as a result of some organisms being “frozen” in the carbonate rocks. With the decreasing temperature, the role of water in the atmosphere was constantly strengthened, mudstone began to form, and organisms frequently changed. The original organisms that lived under high temperature and pressure became extinct because they failed to adapt to the new temperature and pressure conditions, and organisms suitable for the new environment developed. In the future, the Earth will continue to cool, water will condense into ice, the Earth will not be suitable for human habitation, and most of the existing organisms will go extinct. Such a point of view can reasonably explain the Cambrian explosion and later multiple mass extinctions.

Conclusions

5.1. Through many field geological observations and laboratory studies, sandstone and carbonate rocks are found to have magmatic characteristics and should be considered magmatic rocks rather than sedimentary rocks. Combining this information with the principles of Bowen’s reaction series, the Earth is concluded to have undergone a process that gradually evolved from high temperature to low temperature.

5.2. During the gradually cooling evolutionary process, a rock sequence was formed as a result of condensation: high melting point metal → ultramafic rock → mafic rock → intermediate rock → acid rock → sandstone → carbonate rock → mudstone → ice.

5.3. During the gradual cooling evolution of the Earth, a series of biological changes from high temperature to low temperature also proceeded. The carbon-based life on the Earth did not originate from the ocean but from high-temperature carbon-bearing fluids; biological extinction is a natural law.

5.4. As the Earth continues to cool, it will become unsuitable for human habitation. Based on the geological point of view, this time span will be far less than the 4.5 billion years estimated by astronomers. Therefore, people all over the world should reduce military conflicts, enhance studies of human living environments and explore the future of humanity.

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