

Pattern formation of fracture phase separation and its implications for structuring process of continents and oceans

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Phase separation [1-4] is one of phase transitions in mixtures. In this phenomenon homogeneous mixtures of multi components separate into different phases depending on physical conditions such as temperature, pressure, and composition. All matters are mixtures, so that this phenomenon occurs in any matters and is important in any fields of sciences. Recently, a new phase separation was found in polymer solution. It named fracture phase separation [5] because it was characterized by brittle fracture occurred in polymer-rich phase that indicate viscoelasticity. The polymer-rich phase is torn in some regions keeping slight connections with each other. The indentation of the periphery of these regions resembles the form of cracks in brittle materials like glasses, concretes and rocks. Around these regions are filled by solvent-rich phase. These characteristics of the pattern of fracture phase separation are similar to that of the pattern of continents and oceans of the earth.

On the other hand, continents and oceans of the earth is a peculiar feature different from the surface of other planets. These surface structures of the earth have three characteristics: (1) two characteristic matters of both continental rocks composed mainly of SiO₂ and seawater composed mainly of H₂O, (2) two regions of continents and oceans and the form of coastlines dividing the two and (3) two characteristic heights of both continents and ocean floors in solid surface of the earth. How do they occur? An interesting point is that all three characteristics are expressed by two factors. This seems to indicate that these three characteristics are three different sides of results of a phenomenon.

An idea that fracture phase separation concerned deeply with the formation of these surface structures of the earth will be presented. A possibility of occurrence of this phenomenon on the surface of the earth will also be discussed.

References

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Keywords: continents, oceans, structuring process, phase separation, fracture, viscoelasticity