

## The Origin of Life and the Crystallization of Aspartic Acid in Water

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The unusual molecular complexation of the enantiomers of aspartic acid in water was discovered and proven by a solubility test, solution freezing point, crystallization kinetics, and the incubation time change. The transformation of a “conglomerate solution” (CS) to a “racemic compound solution” (RCS) was dependent on both temperature and time. The CS was the solution phase which produced conglomerate crystals, and the RCS was the solution phase which gave a racemic compound. Fourier transformed infrared spectroscopy and powder X-ray diffraction were used to characterize aspartic acid solids crystallized from those complex solution phases and to distinguish conglomerate crystals from a racemic compound. We found that it took more than 36 h at 25 °C and 5 h at 45 °C just to complete the solution phase transformation of the CS of aspartic acid to the RCS of aspartic acid. However, the presence of an equimolar of succinic acid could hinder the solution phase transformation of the CS of aspartic acid to the RCS of aspartic acid for up to at least 8 h at 60 °C. This leeway of hours had provided an opportunity for the thermodynamically stable racemic aspartic acid to convert into the metastable conglomerate in water first by either a rapid acid-base reaction or the addition of an antisolvent with the temperature drop, without being concerned by its back conversion later to a racemic compound thermodynamically for quite some time. As a result, enantioseparation of aspartic acid by preferential crystallization in a large scale would have been very common and easy to occur on the primitive earth.

### Reference

[1] Lee, T.; Lin, Y. K. The origin of life and the crystallization of aspartic acid in water. *Cryst. Growth Des.* **2010**, *10*(4), 1652-1660.