

A Laboratory Model of a Prebiotic, Spontaneous, and Continuous Enantiomeric Enrichment Process

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Abstract Construction and operation of a laboratory model, which combines the lately discovered enantioenrichment method of the author (2007) with the sun-powered evaporative pumping process of Hsu and Siegenthaler (Sedimentology 12:11–25 1969), is described. The model operated continuously for 120 days before it was intentionally shut down, even though it could have continued. During that time it raised the enantiomeric excess of the test material by a factor of 3.6. Implications of these results on the origin of bihomochirality are discussed.

Keywords Biohomochirality · Comets · Enantiomeric enrichment · Evaporative crystallization · Evaporative pumping · Meteorites

Introduction

Crystallizations, when carried out on solutions (particularly water solutions) of non-racemic compounds, have been shown to be important enantioenrichment procedures, especially as they relate to the origin of bihomochirality (Goldberg 1999; 2004; Klusmann et al. 2006; Breslow, et al. 2010).

A few years ago the author described a then newly discovered enantiomeric enrichment process (Goldberg 2007). It was shown in several cases to give rise to significant increases of the more abundant enantiomer in the crystals obtained when dilute aqueous solutions of non-racemic amino and hydroxyl acids were allowed to evaporate from slightly polar surfaces such as terra cotta and silica.

The process was seen as a plausible amplifier of small enantiomeric excesses of various amino acids - presumably delivered to the prebiotic earth by carbonaceous meteorites (Pizzarello 2006) and perhaps comets - to levels required for life to start.

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