Electronic Supplementary Information (ESI)

Enantioenrichment in sublimed amino acid mixtures

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Experimental Section:

1. Sublimation protocols
2. Powder X-ray diffraction (XRD) acquisition data
3. Amino acid derivatization and chiral HPLC analysis

Sublimation protocols: DL-amino acid (racemic compound, 0.03 g) and either L- or D-configured amino acid (0.02 g) were ground in a mortar and placed in a capped flask and heated on a hot stirring plate, which has previously attained a constant temperature of *ca*. 430 ºC. Alternatively, the same enantiomeric imbalance (40%) can be attained by mixing either L- or D-amino acid (0.028 g) and the opposite enantiomer (0.012 g). The mixture was stirred for a few seconds to ensure maximum contact with the hot plate. Sublimation took place suddenly and a dense cloud of condensing microcrystals could be observed for approximately 2 min. Amino acid crystals were deposited on the inner walls and covered most of the flask with the sole exception of 1.5-2 cm above the hotter base (due to the high temperature caused by conductive heating). At this stage, amino acid crystals underwent a further, slow sublimation (which took *ca*. 10 min), thus ascending the sublimation line up to 1/4 height. This process occurred without any further condensation of material from the inner atmosphere; in other words, the sublimed material was deposited on pre-existing crystals.

The solid was cooled to room temperature and then dissolved in 0.01 *M* HCl; the corresponding enantiomeric excesses (*ees*, referred to the whole sample on average) were measured by HPLC (*vide infra*). A gradient-like distribution of *ees* could also be inferred from analyses conducted on horizontal bands from the sublimation line upwards. The highest *ee* was measured at the sublimation line and decreased gradually as one moved upwards.

Powder XRD acquisition data: Room-temperature powder XRD patterns were collected in air using a Siemens D500 XRD diffractometer (Cu Kα radiation) and a graphite monochromator. The samples were random-powder specimens. Powders were scanned over the range $2^{o} < 2\theta < 65^{o}$ at a scan rate of $0.02^{o}/3$ sec. XR Diffractograms enable phase identification of solids as racemic compounds or conglomerates. Besides valine, isoleucine converted from a racemic compound to a conglomerate phase after high-temperature sublimation (Figure S1).

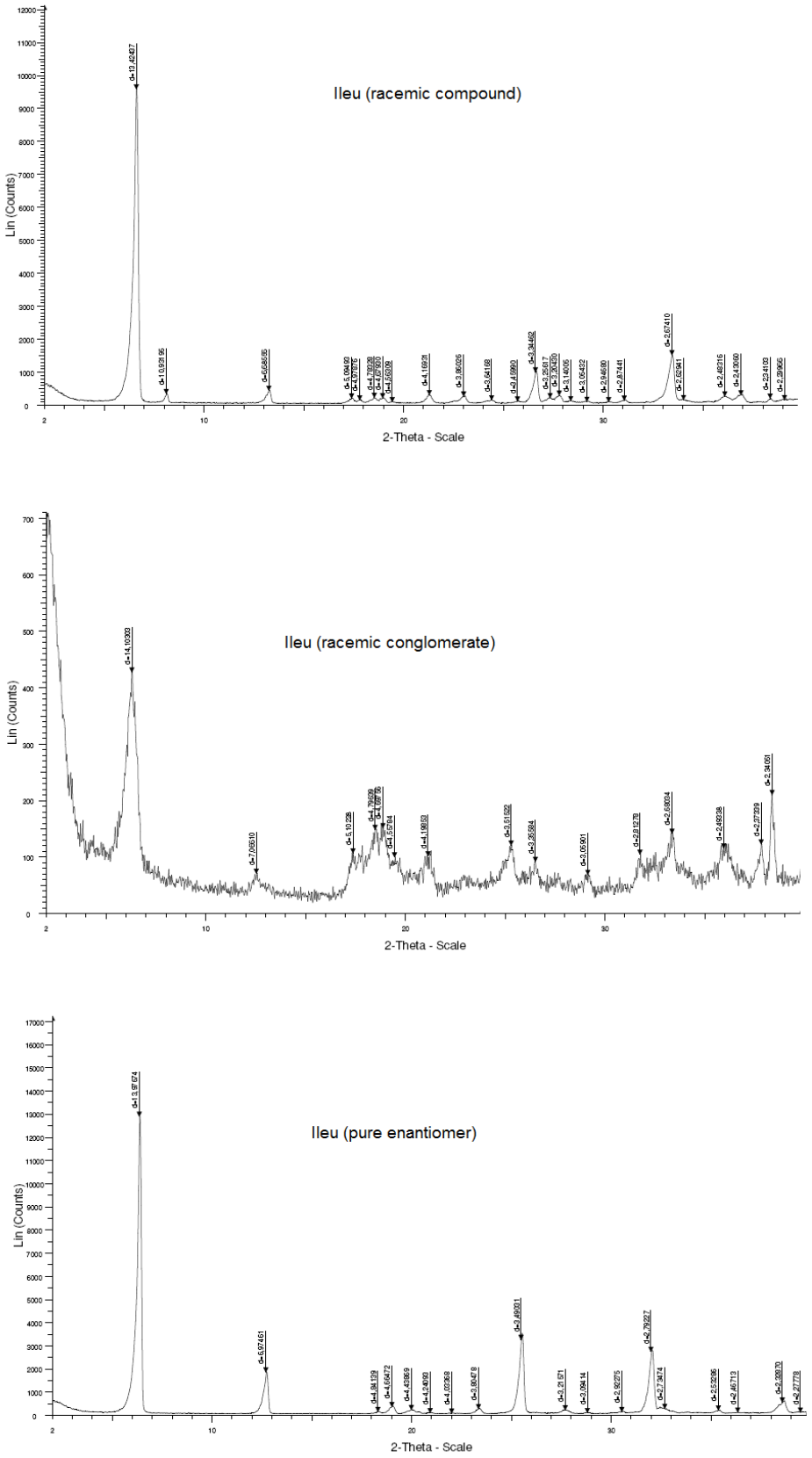

Fig. S1 From top: Powder X-ray diffractograms of *rac*-isoleucine before sublimation (a racemic compound); after sublimation at 430 ºC: *rac*-conglomerate (i.e. racemic mixture of individual D- and L-Ileu crystals); enantiomerically pure Ile sample for comparative purposes (bottom).

Derivatization and HPLC analysis: Enantiomeric excesses were measured via HPLC analysis with previous derivatization of amino acids. The derivatization protocol was carried out before injection and involves the treatment of the sample (2 μL solution) with the pre-column derivatization reagent (2.2 μL), which consists of a chiral thiol (isobutyryl-L-cysteine, 260 m*M*) and *o*-phthaldialdehyde (170 m*M*), dissolved in 1.0 *M* potassium borate buffer solution at pH 10.4.

Samples were rehydrated using 0.01 *M* HCl (750 μL/mg) and then injected into an Agilent HPLC-1100 apparatus, equipped with a fluorescence detector. Excitation and emission wavelengths were 335 and 445 nm, respectively. A Hypersil BDS C18 reverse-phase column (5 μm; 250 x 4 mm i.d.) was used for the analysis.

Eluent A consisted of 23 m*M* sodium acetate plus 1.5 m*M* sodium azide and 1.3 m*M* EDTA, and adjusted to pH 6.0 with 10 *M* sodium hydroxide and 10% aqueous solution of acetic acid. Eluent B was HPLC-grade methanol, while eluent C consisted of HPLC-grade acetonitrile. A linear gradient was performed at a rate of 1.0 mL min^{-1} at 25 ºC, from 95% eluent A and 5% eluent B upon injection to 76.6% eluent A, 23% eluent B, and 0.4% eluent C until min 31 and then with a progressive gradient at 1.07 mL min^{-1} to 46.2% eluent A, 48.8% eluent B, and 5.0% eluent C until min 95.

Retention times: L-Ala (45 min), D-Ala (49 min); L-Val (60 min), D-Val (68 min); L-Ileu (72 min), D-Ileu (80 min); L-Leu (79 min), D-Leu (83 min).