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MIRROR SYMMETRY BREAKING IN THE SYNTHESIS OF CIS-[COBR(NH3)(EN)2]BR2

Abstract

In 1990, Asakura accidentally discovered the fantastic phenomenon of mirror symmetry breaking in the preparation of cis-[CoBr(NH₃)(en)₂]Br₂[1-2]. Different from the “asymmetric autocatalysis” mechanism held by Asakura, we have proposed a new mechanism to explain the phenomenon of mirror symmetry breaking for some systems similar to such inert Co(III) complexes., which could be simply summarized as the racemization of the - or -Co(III) complex catalyzed by the electron transfer between Co(II) and Co(III) species in combination with the preparation of the single enantiomer induced by chiral crystals[3], i.e., “catalysis-crystal induction” mechanism. Fortunately, we have successfully observed the mirror symmetry breaking in the synthesis of cis-[CoBr(NH₃)(en)₂]Br₂. Interestingly, the statistical results of repeated experiments over 376 times were 71 times for -configuration, 164 times for -configuration, and 141 times for rac-configuration respectively. According to the above mechanism, we have also further improved the preparation methods of chiral cis-[CoBr(NH₃)(en)₂]Br₂, by adding the chiral crystal seeds to induce the chiralselective synthesis of chiral products without any resolution agents. And the chiral crystals of cis-[CoBr(NH₃)(en)₂]Br₂ were prismatic, while the achiral crystals are needle-like or flake. Hopefully, these results could provide some usefully evidence for exploring the origin of chirality.

Reference [1] Asakura, K.; Kobayashi, K.; Mizusawa, Y.; Ozawa, S.; Osanai, S.; Yoshikawa, S. *Physica, D.*, 1995, 84(1-2): 72-78. [2] Asakura, K.; Kondepudi, D. K.; Martin, R. *Chirality*, 1998, 10(4): 343-348. [3] Zhang, H.; Wang, X.Y.; Chen L. Q.; Fang, X. M.; Gao, J.X.; Xu, Z.G. *Acta Phys. -Chim. Sin.*, 2006, 22(5): 608-615.