Advanced Technology Program

U.S. Department of Commerce

Technology Administration

National Institute of Standards and Technology

IBC Advanced Technologies, Inc. American Fork, UT

Non-Chromatographic Enantiomer Separation and Purification with High Separation Factors

Technologies:	Separation Technology
Project length:	3 years
ATP funds:	$2,000 K
Cost-shared funds (est.):	$1,042 K
Total project funds (est.):	$3,042 K

As Alice discovered, the side of the mirror that you're on is extremely important, and this is particularly true in the pharmaceutical industry. Many biologically active molecules come in mirror images, right- and left-handed, and often only one of the two exhibits the desired properties. In the drug methorphan, for example, the dextro-isomer is effective for cough/cold suppression, while the levo-isomer is a potent narcotic. Other examples include antibiotics such as amoxycillin, ACE-inhibitors captopril and enalapril, the artificial sweetener phenylalanine, the pain-killer ibuprofen, and many more. Beyond pharmaceuticals, there are important markets for "enantiomerically pure" (or "chiral"–only one side of the mirror) molecules in the manufacture of pure chemicals, pesticides, biochemicals, flavors, and aromas. In some cases, natural processes can be used to produce enantiomerically pure compounds, but some molecules are too complex or too expensive for this route to be commercially practical. The alternative is to synthesize the desired molecules in enantiomerically mixed ("racemic") batches and separate out the desired half. However, separation technologies–predominantly using chromatography–are difficult and expensive as well. IBC Advanced Technologies proposes a novel approach to large-scale separation of enantiomers from racemic mixtures using molecular recognition technology. Tailored chiral molecules would be chemically bound to a solid substrate and immersed in the racemic mixture. The chiral hosts should bind chemically to the product molecule but "prefer" and bind more readily to one enantiomer over the other. A simple chemical process then releases the product molecules from the hosts, which can be reused–the process could be repeated for several passes to get the desired degree of separation. IBC has considerable experience in using similar systems to separate ions from solutions. The ATP project will focus on the challenging problem of developing suitable chiral hosts and the methods for attaching them to substrates without changing their chiral-selective properties. If successful, the process would enable rapid, highly efficient on-line separation of racemic mixtures in large volumes.

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