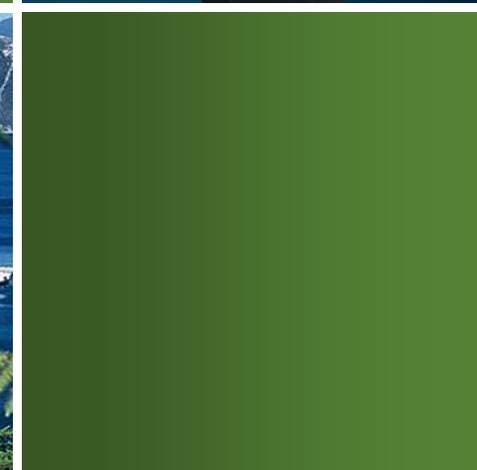
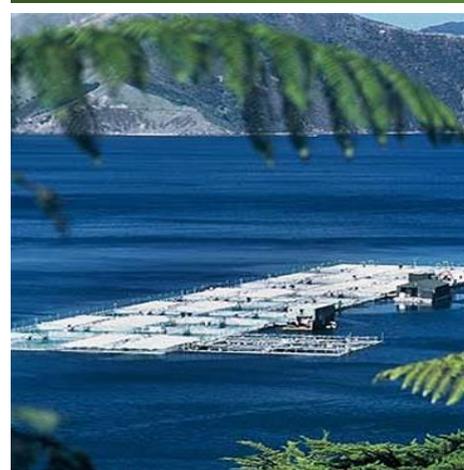


Abstract for Astaxanthin (Pigment) Abstraction from Atlantic Shrimp Shells

*This abstract covers general technical and
market aspects of Astaxanthin extraction*



ASTAXANTHIN INTRODUCTION

Astaxanthin is a carotenoid. It belongs to a larger class of phytochemicals known as terpenes. It is classified as a xanthophyll, which means "yellow leaves". Like many carotenoids, it is a colorful, lipid-soluble pigment. Astaxanthin is found in microalgae, yeast, salmon, trout, krill, shrimp, crayfish, crustaceans, and the feathers of some birds. Professor Basil Weedon was the first to map the structure of astaxanthin.

Astaxanthin, unlike some carotenoids, is not converted to vitamin A (retinol) in the human body. Too much vitamin A is toxic for a human, but astaxanthin has lower toxicity. It is an antioxidant with a slightly lower antioxidant activity than other carotenoids. While astaxanthin is a natural nutri-

tional component, it can also be used as a food supplement. The supplement is intended for human, animal, and aquaculture consumption. The commercial production of astaxanthin comes from both natural and synthetic sources. The U.S. Food and Drug Administration (FDA) has approved astaxanthin as a food coloring (or color additive) for specific uses in animal and fish foods. The European Commission considers it food dye and it is given the E number E161j. Natural astaxanthin is considered generally recognized as safe (GRAS) by the FDA.

Astaxanthin Market

It is a carotenoid compound with Vitamin A structure. Less than 10 % of food colours have fish sources.

Hoffmann La Roche is the leading producer of this colour as synthetic colour. The industrial process is difficult and no real replace for the natural sources. Shrimp and salmon is the best source for this colour. Also the biotech industry like *Phaffia rhodozyma* tries to produce this pigment with microbial fermentation. The extraction from red algae's is an alternative way to gain this pigment. The high energy costs for synthetic production and difficult technology is a disadvantage for feasibility of the synthetic product.

ASTAXANTHIN MARKET

The Biggest Producer of Astaxanthin

Suppliers	Countries	Technologies
DSM - Roche	SWI	Synthetic
BASF	GER	Synthetic
Igene	USA	Fermentation
ADM	USA	Fermentation
Fuji	JAP	Fermentation

The market volume of astaxanthin is around 120 MT in 2002; the price is around 1800-2100 USD/kg. For the naturally extracted product the consumer pays 20-50 % more than this price. The average market growth rate is about 7-8 % per year because of rapid growth of salmon farms worldwide.



ensymm is a German based premier project consulting company for Life Sciences, serving biotech companies, pharmaceutical industry and food ingredient companies. We provide clients with a variety of business and technology consulting services as well as with specialized teams in various areas of our competence.



For further inquiries and quotes, please contact:

ensymm UG & Co.KG

Life Science Center Dusseldorf
Merowingerplatz 1
40225 Dusseldorf
Germany

Tel: 0049 2113367527

Project_assistant@ensymm.com

www.ensymm.com

