Flavours – From the Natural Source

Dr Hormaz Patva, Sensient India Private Limited

Flavour is the sensory impression of a food or other substance, and is determined mainly by the chemical senses of taste and smell. The "trigeminal senses", which detect chemical irritants in the mouth and throat, may also occasionally determine flavor.

Natural Flavours are not new and many of the earliest essences used widely were from extracted sources. Today, however Natural Flavours are closely defined and are making a comeback. This with increase in consumer interest in the foods and beverages that can be claimed as 100% Natural, has added to the value to Natural Flavours.

Natural Flavours

Natural flavours in the past were typically based on materials such as fruit juice volatiles, essential oils, (citrus based), and even concentrated fruit juices, Such starting materials were often and are still used for fractionation by simple liquid-liquid extraction and then enhanced by the most limited range of true aroma chemical e.g. vanillin The resulting products would then be dispersed into an appropriate solvent.

Today, there is a very wide range of aroma chemicals available that enables flavourists to make natural flavours by simple compounding techniques that are direct analogous to the way nature-identical aroma chemicals have always been made, however there are natural botanical extracts available using a range of technologically advanced low temperature processing techniques, giving unique products of high concentration and purity for applications in flavours as well as fragrances. These natural botanical concentrated extracts are an exact replica of Natures creativity and denotes the pleasing alternation and variety of flavour/aroma tones as they succeed each other in total profile.

These are extracted using single or series of complex extraction processes to ensure the purity, integrity as well as minimum thermal degradation. from original botanical materials such as seeds, roots, leaves, berries and flowers. These processes include low temperature extractions with solvents, molecular distillations, cold press expressions, liquid carbon dioxide extractions, the results of the extracts are either essential oils, absolutes, concretes, depending on the type of extraction.

Extraction Techniques:

Liquid Carbon Dioxide extraction

Freshly milled raw material is packed into stainless steel extraction columns, and treated to a dynamic flow of carbon dioxide in liquid form, at pressures of 40 to 60 atmospheres, and low temperatures between 0 and 10 ^{0} C. The liquefied carbon dioxide dissolves the lower molecular weight organoleptically active components of the botanical raw material, leaving behind the higher molecular weight unwanted materials such as heavier fats, waxes, pigments, sugars, starches and tannins. The solution of product in CO_2 emerging from the extraction columns is passed to a sophisticated heat exchanger. This leaves a pure extract of the product which is tapped from the process under pressure, still below ambient temperature.

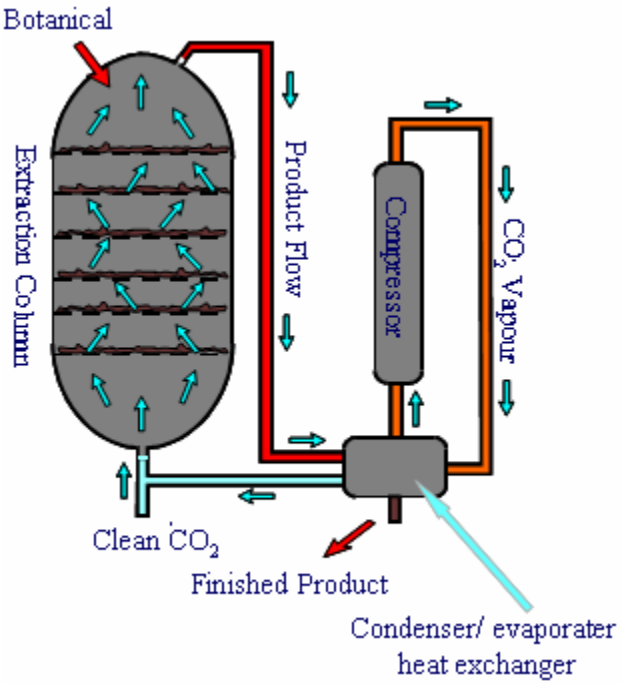

Fig1: Liquid CO_2 Extraction

In order to have much more selective extraction for raw materials having low oil content, ethyl alcohol is used as an entrainer at a low level into the flow of CO_2 prior to extraction. This unique selective solvent mixture gives an extract in alcohol solution which captures the flavour and aroma.

Counter Current Extraction:

Citrus oils in hydrocarbon solvent are continuously fed into a specially-designed column containing many compartments and this complex mixer, in which a counter-flow of ethanol containing a small amount of water extracts the flavour and aroma molecules, leaving the terpenes to emerge from the opposite end of the column. The process takes advantage of the different chemistry and molecular structure of the hydrocarbon terpenes, which after removal form a valuable by-product.

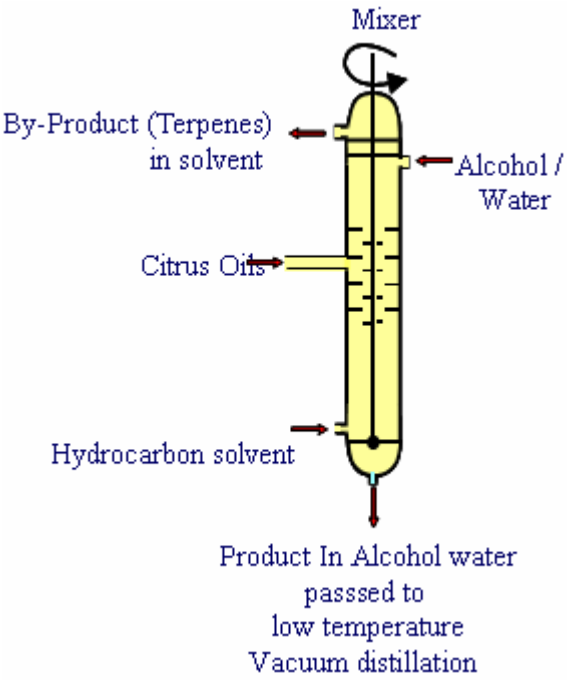

Fig 2: Counter current Extraction

Vacuum Distillation

This is one of the simple techniques for concentration of essential oils before molecular distillation and for concentration/rectification of oils. The raw material or crude oil is heated under vacuum at precisely controlled temperatures, turning the components into vapour, which is then cooled and condensed to a purified liquid product.

Molecular distillation

This distillation technique employs a complex still which subjects the material to heat for the briefest possible time, while at the same time allowing a very high vacuum to be achieved, which lowers the vaporizing temperature, contributing further to the limited exposure to heat. The Molecular, or Falling-Film Short-Path Still, uses a different design to traditional batch distillation allowing a continuous feed of liquid to enter the still and pass down the inside of a heated jacket, wiped into a thin film by the centrifugal force of rotating rollers, and falling by gravity. The key use for the Molecular distillation process is to refine further products and also de-colour them.

Solvent Extaction:

Solvent extraction, as a technique routinely uses water, alcohol, and their azeotropic mixtures under a range of conditions to produce extracts in solutions. The process involves a combination of static cold extraction and/or dynamic flowing extractions at slightly higher temperatures. Individual products are created by varying the time, temperature, static or flowing conditions.

Alcohol Co-Distillation:

A number of products are manufactured by distillation process involving the addition of pure alcohol to the botanicals which are first treated with water, followed by atmospheric pressure or low-vacuum distillation of the alcohol and some water which co-distils the more volatile components to yield a high aroma product

Some of the advantages associated with these type of natural products are clean label, 100% Natural, enhanced functionality, product differentiation and true to nature.