**Technology for Bio-based cosmetic ingredients- Bio-IDD and Bio-IHD**

**Abstract:**

Cosmetics, dermatology or pharmacy markets are increasingly demanding ingredients of biological origin for the formulation of their products. Although biosourced active ingredients, emulsifiers and plant oils have developed substantially in the last few years and are now widely available in the market, biosourced emollients, especially hydrocarbon emollients with a 100% biological origin, are still rare. This study is an effort towards de-fossilization of cosmetics and other related sectors.

An isoparaffinic composition to be used as a Cosmetics, dermatology or pharmacy component is prepared by a process of 1. Fermentation of sugar especially low carbon intensity sugar such as sugar cane molasses to isobutanol 2. Catalytic dehydrogenation of isobutanol to isobutylene in the presence of solid acid at high temperature 3. Catalytic Oligomerization of isobutylene to a mixture of unsaturated hydrocarbons and 4. Hydrogenation of this composition to a mixture of saturated hydrocarbons using a catalyst at high temperature and pressure. 5. Purification and Deodorization of the compounds. All the processing steps are carried out in continuous mode in a fixed bed reactor. This formed saturated hydrocarbon mixture is then purified by removing high molecular weight and low molecular weight compounds by fractional distillation to desired isododecane and isohexadecane, specifically 2,2,4,6,6-pentamethyl heptane (Bio-IDD) and 2,2,4,6,6,8,8-heptamethylnonane (Bio-IHD). As the requirement is of only specific isomers, meticulous purification methodology with very stringent purification conditions is necessary. A polishing step is developed for deodorization of Bio-IDD and Bio-IHD using a commercially available adsorbent. The polishing step is carried out at room temperature and atmospheric pressure and the sensory / olfactory test of these two compounds were passing the quality requirements for cosmetic applications.

Various sugar feedstocks having lower carbon intensity e.g sugar cane molasses are processed via fermentation to isobutanol. Other feedstocks such as biomass and grains can be used in fermentation after pre-treatment. This bio-based isobutanol is subjected to three catalytic steps using commercially available catalysts to make a mixture of hydrocarbons. These hydrocarbons are further purified and after polishing using an adsorbent produces Bio-IDD and Bio-IHD, to match the desired specifications. The final product contains 100% carbon of biological origin. Thus, the bio-based feedstock such as sugars are first converted to isobutanol,

which acts as a platform molecule, which further converted through cost effective process and its derivatization through neat and clean technology to Bio-IDD and Bio-IHD

These products Bio-IDD and Bio-IHD are free of aromatics, sulphur containing molecules and polar compounds. It has low odor and very low toxicity.

The emollients currently used in cosmetics do not come from renewable resources. Therefore, there is still a need to have a biosourced emollient composition that has physical-chemical and sensory characteristics in particular in terms of stability, volatility, spreading on the skin, odor, soft touch and brilliance, making it highly compatible with a use in formulation.