

SUCROSE – A PROSPERING AND SUSTAINABLE ORGANIC RAW MATERIAL

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Sucrose is produced on the industrial scale from sugar beet or sugar cane with a present annual production of 161 Mio metric tons (2006/07). It is the most available carbohydrate and until now mainly used for nutrition purposes, bioethanol production (Brazil) and in the fermentation industry. Only to a smaller extend sucrose has been utilized as feedstock for organic chemicals. And this, though many attempts have already disclosed the valorisation of sucrose for this purpose.^{1,2} By the following three basic reaction pathways sucrose could be converted into valuable chemical compounds.

1.) By degradation of the sucrose skeleton: The announced bio-ethylene production via bio-ethanol in Brazil appears to be one of the most promising approaches which open the door for the whole ethylene derived C2-chemistry. Also 5-(hydroxymethyl)furfural (HMF) and levulinic acid are regarded as valuable sugar-derived intermediates for chemical products, for the time being regrettably not yet able to compete in price with petrochemical derived products. Catalytic hydrogenation of sucrose under elevated temperature and pressure opens access to valuable polyhydric compounds, like 1,2-propylene glycol, useful in many cosmetic, pharmaceutical and technical applications.

2.) By reactions of sucrose under preservation of the sucrose scaffold: These reactions fortunately lead to several products of interest for food and non-food application. Among these compounds are sucrose esters, polyurethanes and also the well known high intense sweetener sucralose.

3.) By modifications maintaining carbohydrate structure: Technical interesting substances could be achieved from sucrose by enzymatic cleavage and/or rearrangement of the sucrose building blocks D-glucose and D-fructose, thereby giving access to products like isomaltulose (commercially available as palatinose™) and isomalt or polymeric compounds like oligofructose, inulin and levan or neo-amyllose and dextran.

Many valuable contributions demonstrate impressively the utilisation of sucrose as feedstock for basic chemical compounds. The hesitant implementation in industry appears clearly cost driven and may change due to the estimated medium-term shortage of petrochemical feedstocks. As a renewable organic bulk chemical sucrose seems to be predestined as potential “player” as a feedstock for the chemical industry.

1. Y. Queneau, S. Jarosz, B. Lewandowski, J. Fitremann, *Adv. Carb. Chem. Biochem.*, 2007, **61**, 217.

2. F. W. Lichtenthaler in *Biorefineries – Industrial Processes and Products*, Eds. B. Kamm, P. R. Gruber, M. Kamm, Wiley-VCH, Weinheim, 2006, 2, S. 3.