Electrochemical COnversion of CARBohydrates

Publieke samenvatting / Public summary

Aanleiding

The Paris Climate Agreement's objective is to restrict the global temperature increase to well below 2°C. Moreover, the Dutch climate change legislations' (Klimaat wet) target is to reduce CO2 emissions by 49% by 2030 and 95% by 2050, compared to 1990 levels. Within the chemical industry the largest abatement potential for CO2 reduction is the shift from fossil-based towards bio-based feedstock. Since the chemical industry is becoming the biggest driver for the increased global oil consumption and given the (inter)national climate protection targets, it is actively exploring processes based on renewable feedstock to significantly reduce its CO2 emissions. Sugars/starch are ideal renewable starting materials for producing value added chemicals.

Doelstelling

Electrochemistry is an ideal tool for converting carbohydrates to a broad range of products. It is characterized by high energy efficiency, high selectivity, ambient conditions, and the potential to utilize green electricity directly. Combined with the biobased original of the feedstock, this can allow significant reduction of carbon footprint. This project will develop and demonstrate, together with the industry, a novel electrochemistry based methodology for the production of alternatives for polyacrylates, which have a broad range of uses (e.g. as detergents). Replacing the currently used polyacrylates by electrochemically produced bio-based alternatives will both benefit the reduction of CO2 and reduce waste production. Furthermore, the electrochemical process will produce hydrogen at

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the counter electrode. This hydrogen will be used for the reduction of bio-based feedstock such as fructose to mannitol, resulting in a total usage of the electrochemical process – again increasing energy efficiency. Therefore this project will design and develop such an electrochemical process using bio-based feedstock (soluble [poly] saccharides such as sucrose and inulin).

Korte omschrijving

WFBR and TNO will develop electro synthetic approaches to convert carbohydrates to polyacrylate alternatives for builder and co-builder applications (a multibillion euro market including detergents). Ecover will test the polyacrylate alternatives which will be produced in the future by Cosun or ADM. ADM will test the oxidised starch products on their merits. Both Cosun and ADM will determine the techno-economic potential and market applications of the derived products and electrochemical process.

Resultaat

New bio-based products are developed based on both oligo and polysaccharides and their potential in the market is identified. For the production of bio-based carbohydrate products an electrochemical process is designed, optimised and demonstrated up to TRL4 level. These new carbohydrate products will strengthen the Dutch bio-based economy and aid CO2 reduction within the chemical industry. The results from the techno-economic and market evaluation will be used for future research directions in order to come to a cost competitive process and products. The obtained results will be used to outline an exploitation plan.

De data in deze applicatie is afkomstig van de Rijksdienst voor Ondernemend Nederland (RVO) en wordt in samenwerking met de Topsector Energie ontsloten.
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