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Producing graphene from biogas: an innovative, renewable and cost-effective value-chain for industrialising the material of the future

HORIZON 2020 Producing graphene from biogas: an innovative, renewable and cost-effective value-chain for industrialising the material of the future

Berichterstattung

Projektinformationen

BIOGRAPHENE

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Projektwebsite 🗹

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Koordiniert durch BIOGENERA RENOVABLES SL Spain

Periodic Reporting for period 1 - BIOGRAPHENE (Producing graphene from biogas: an innovative, renewable and cost-effective value-chain for industrialising the material of the future)

Berichtszeitraum: 2019-08-01 bis 2020-01-31

Zusammenfassung vom Kontext und den Gesamtzielen des Projekts

Graphene is a single layer of carbon atoms that is frequently defined as "the material of the future" due to its outstanding features. However, graphene is an expensive-to-produce material, its industrial use is still very limited, and its production has been environmentally harmful (high-energy demanding, non-renewable source, etc.). With this project, we aim to develop an innovative technical approach to scale up the production of graphene in an industrial way from a renewable source: biogas. Thus, our graphene will be manufactured with a circular bioeconomy approach, since biogas is produced from organic waste from the agro-food industry or wastewater treatment plants, which increases the value of our product: BioGraphene. We will sell and install our plug and play innovation, BioGraphene Production Unit, in Biogas plants. Our unit will, firstly, increase the proportion of methane in the biogas, and secondly, will generate graphene A4 sheets and rolls from this transformed biogas via Chemical Vapor Deposition (CVD). These are marketable products that can be mass-produced, satisfying the market demands due to its competitive price. During the feasibility study of the SME Instrument Phase I, we mainly: (i) aimed to set the optimal technical parameters needed for an accurate and high-quality production of graphene from a renewable source; (ii) assessed the market needs and our commercialization strategy; and (iii) analysed the financial viability and needs for the success of the project.

Arbeit, die ab Beginn des Projekts bis zum Ende des durch den Bericht erfassten Berichtszeitraums geleistet wurde, und die wichtigsten bis dahin erzielten Ergebnisse

During the 5 months of implementation of the project, we have achieved a significant progress beyond the work plan presented in the proposal. We have demonstrated the feasibility of our project in the three main areas: Technically, we tested the viability of our prototype and estimated the optimization of the technical parameters as well as the requirements for the production of BioGraphene at large scale. Our validation tests demonstrated that biogas filtration and cleaning processes are appropriate for achieving the proper methane concentration that will be used for the BioGraphene production. We also set the optimal technical parameters needed for an accurate procedure inside the Chemical Vapor Deposition (CVD) reactor and designed a prototype for the BioGraphene Production Unit. This technical assessment concluded that our technology will be able to produce high-quality BioGraphene from a renewable source. Commercially, we examined in depth the global market, concluding that there is an existing and increasing need for using renewable sources to produce graphene, but also for scale-up its production and reduce the current price of graphene. Thus, we agree that our innovation will benefit from the great expansion forecasted for the graphene market and from the EU investment and regulations. Moreover, the large number of biogas plants established already in Europe (17,783 in 2017) guarantees the complete integration of BioGraphene's technology. Lastly, financially, after the development of our business strategy, we estimated that, after 5 years of commercialisation, BioGraphene will bring Biogenera Renovables S.L. a financial profit and create

new job positions. This shows that the implementation of BioGraphene is not only financially viable, but also it is an important source of employment creation for the company.

Fortschritte, die über den aktuellen Stand der Technik hinausgehen und voraussichtliche potenzielle Auswirkungen (einschließlich der bis dato erzielten sozioökonomischen Auswirkungen und weiter gefassten gesellschaftlichen Auswirkungen des Projekts)

It is expected that graphene demand will sharply grow in the next years and is a priority for the EU to lead its production globally. In the agri-food industry and wastewater treatment plants, they use the wet waste biomass to generate biogas as renewable energy. Our technology will effectively upgrade this biogas into biomethane, which is an organic carbon source that will be used as raw material for manufacturing graphene in a circular economy approach: BioGraphene.

Currently, we, Biogenera Renovables S.L. have a working prototype of the technology (now TRL6) in collaboration with R&D companies and suppliers to achieve BioGraphene industrialisation. We are finetuning an innovative business model to have a long-term leadership in the graphene market. Our business model consists in partnering with biogas plants to install our technology in their premises, as well as sharing the profits of the sales with them, allowing graphene production to be economically viable at industrial scale and, at the same time, increase the profitability of biogas plants and boost the renewable energy sector. Our breakthrough technology coupled with our business model has the potential of transforming the industrial production of graphene. Different types of industrial sectors will benefit from our sustainable and low cost product, since BioGraphene will be sold to companies of the field of electronic applications, food & beverage, automotive, medicine, packaging,... that are currently highly interested in incorporating graphene to strengthen their products and materials.



Logotype of the project

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