Crude oil no longer needed for plastics

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Each year the world produces about 130 million kilo of ethene, the most important raw material for plastics. This gigantic industry is currently dependent on crude oil. And that is running out. Dutch researcher Tymen Tiemersma might have found a solution for this problem. With his new reactor we can produce ethene from natural gas and, therefore, in the future from biogas as well.

Tiemersma found an apparently very simple solution for one of the biggest problems in producing ethene from natural gas. If you want to produce plastics from natural gas then you first of all need to convert the natural gas into ethene. That can currently be done but one vital problem occurs: the process generates an incredible amount of heat, too much to remove easily.

Consequently the conversion of natural gas is far too expensive and consumes a lot of energy. Yet natural gas is not only used for the production of ethene. It is also the raw material for syngas, a mixture of carbon monoxide and hydrogen. And the production of syngas happens to require a lot of heat. What would be more logical than combining the two processes thought Tymen Tiemersma.

The process technologist merged the production of syngas with the production of ethene and developed a method for obtaining both substances efficiently from natural gas. With just one catalyst, a particle that makes it possible to convert one substance into another, he combined the two production processes. The production of ethene generates the heat needed for the production of syngas - which must take

place at temperatures around 800 degrees Celsius - and the syngas absorbs the heat from the production of ethene, thus avoiding the need for this process to be cooled down.

Using the new catalyst, ethene for the production of plastics can be obtained from natural gas. However, the combined production process offers even more possibilities. Electric vehicles can ride on hydrogen from the syngas and hydrogen is also needed for the production of artificial fertiliser. Carbon monoxide is used together with hydrogen for the production of synthetic fuels.

Natural gas is one of the three most important fossil fuels and is still present in large quantities. Thanks to the catalyst particle, the available natural gas can be used more effectively in the future. However, scientists are also working hard on obtaining methane, the most important constituent of natural gas, from biomass such as plant waste. Using Tiemersma's technique it might in the future be possible to produce bioplastics and biofertilisers as well.

Now that Tiemersma has demonstrated that his idea works, the next step is to produce and test the particle. Only then will it be clear whether the large-scale use of this smart catalyst is possible.

Tiemersma carried out his doctoral research within the ASPECT programme, which focuses on the catalysis of bulk chemical processes with the aim of increasing the sustainability of these. ASPECT is part of the NWO temporary taskforce ACTS (Advanced Chemical Technologies for Sustainability).

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