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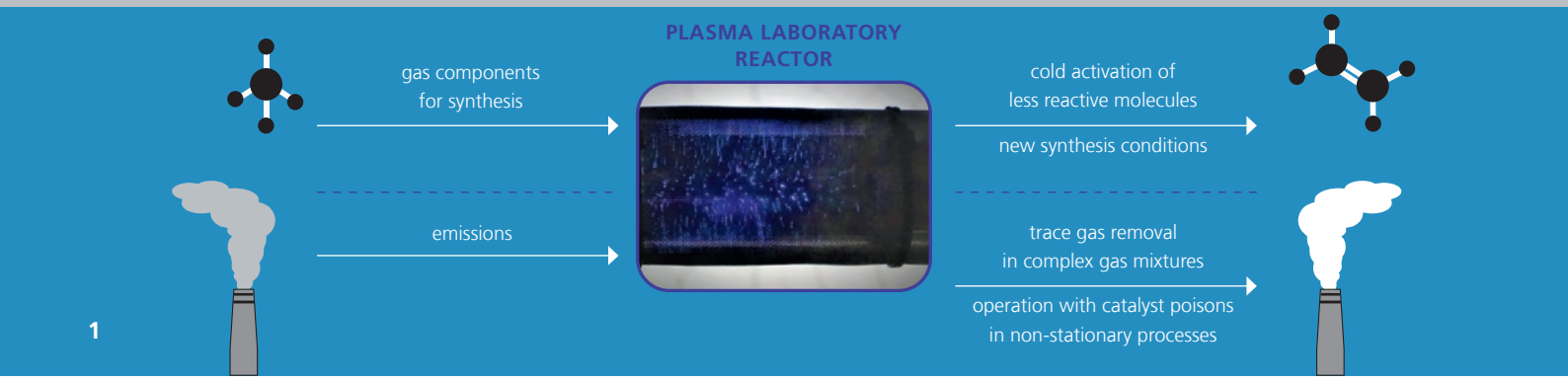

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1 *Illustration of possible conversion routes by gas activation with non-thermal plasma – exemplified by a plasma laboratory reactor of Fraunhofer UMSICHT.*

GAS CONVERSION BY ACTIVATION WITH NON-THERMAL PLASMA

THE IGNITING IDEA FOR COLD GASES

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The transition process from fossil fuels to renewable energy sources as well as the necessary reduction of environmentally relevant and climate relevant emissions continuously challenge conventional conversion technologies.

Necessary high activation temperatures, complex gas mixtures containing deactivating substances as well as dynamic process conditions can limit the realization of thermochemical or catalytic conversion processes. These limitations can be overcome by combining conventional conversion processes with non-thermal plasma (NT-plasma) and furthermore generate new possibilities for chemical conversions.

Keywords

- Non-thermal plasma (NT-Plasma)
- (Plasma)Catalysis
- Gas treatment
- Synthesis gas chemistry
- Gas phase reactions

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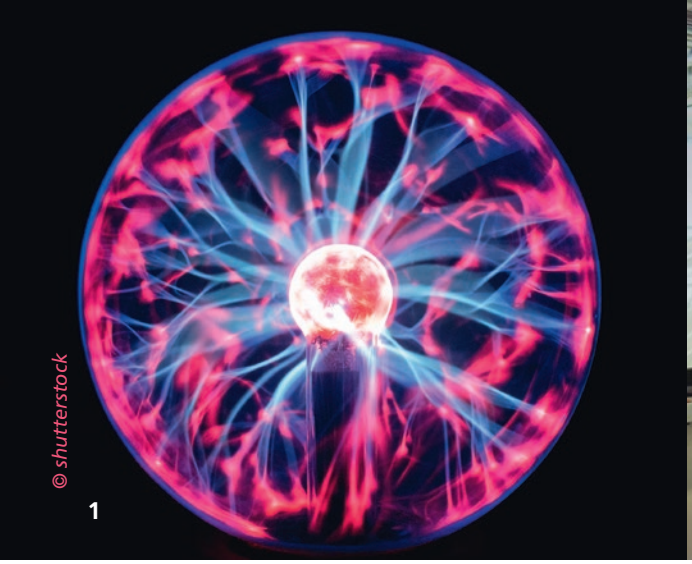
- (Waste)Gas treatment, cleaning, and postprocessing
- Chemical industry
- Hydrogen economy
- Bio gas plants
- Environmental engineering
- Energy technology



1 *NT-Plasma in a plasma sphere.*

2 *Test rig for gas acitivation with non-thermal plasma at Fraunhofer UMSICHT.*

Your benefit and our contribution

The NT-plasma technology is an innovative and by use of regenerative generated electricity sustainable technology, which is robust against a multitude of catalyst poisons and can be flexibly controlled along todays increasingly varying process conditions. NT-plasma supports and optimizes known conversion processes and can furthermore potentially be used for the development of new gas phase conversions and applications.

Based on our experience with application-oriented developments of NT-plasma in the field of gas treatment, we can identify the plasmachemical and plasmacatalytic systems which are most suitable for your requirements, investigate them experimentally and develop the plasma reactor that is precisely tailored to your application from laboratory to industrial scale.

Our services

Technological advice

- (Initial) Assessment of the suitability of NT-plasma technology for your application
- (Feasibility) Studies on technical, chemical, and economic issues

Process development

- Identification and/or conception of suitable reactor systems
- Development, design and manufacturing of adapted plasma reactors for your application
- Experimental development: execution and evaluation of test series and parameter studies

Upscaling

- Upscaling conception
- Development, design, and manufacturing of NT-plasma reactors up to industrial scale in partnership with you, if necessary with recourse to our partner/supplier network

Our test infrastructure

For your development order we provide the following test infrastructure as standard:

Gas supply

- Gas mixtures consisting of H_2, CO, CO_2, CH_4, N_2 und O_2
- Dosing and vaporization of liquid components (e.g. H_2O, toluene); addition of additional components (e.g. NO_x) by request

Test rig

- High-voltage generator (0-20 kV_{pp} | 4-500 kHz)
- NT-plasma reactors for plasmachemical and plasmacatalytic experiments up to 1 Nm³/h
- Temperature control up to 200 °C

Analytics

- H_2 content (TCD)
- $CO/CO_2/CH_4$ content (IR)
- O_2 content (paramagnetic and electrochemical | ppm range)
- Gas chromatography with TCD, FID, MS