Rational Catalyst Design for Tar Reforming: A Kinetics Driven Methodology

**Aim**

Development of an innovative catalyst family for the reforming of the tar fraction obtained after biomass gasification.

**Justification**

Biomass gasification represents an alternative production route towards synthesis gas, i.e., CO + H\(_2\), rather than natural gas. A significant fraction of the processed biomass only partially decomposes into larger (hydro)carbon fragments than CO and, hence, requires further treatment to obtain the desired synthesis gas.

A team comprising 14 European industrials and academics that are amongst the leading experts in the field, has joined forces as part of a EC funded integrated project to tackle this issue and develop a catalyst that is matching the challenging requirements.

Rational catalyst design for industrially relevant chemical reactions belongs to the core expertise of the Laboratory for Chemical Technology at Ghent University. A unique synergy between catalyst synthesis and testing on the one hand and detailed kinetic analysis on the other hand provides a strategic advantage on the route towards novel catalysts.

**Program**

The design of a novel reforming catalyst will be ‘kinetics driven’. As a first step pilot plant data acquired by project partners will be ‘down-scaled’, i.e., the determining phenomena will be determined and quantified by adequate kinetic models. This analysis will set the boundaries for further activities in rational catalyst design at the laboratory scale and up-scaling towards the industrial scale.

A comprehensive experimental program aimed at the determination of tar reforming kinetics will be pursued. Catalyst activity and stability will be explored via high throughput testing. **Intrinsic kinetics** will be determined by applying non-steady-state conditions using a Temporal Analysis of Products (TAP) equipment. Both ‘as prepared’ and ‘used’ catalysts will be investigated and the observed kinetics will be quantified by physically meaningful model parameters. **Deactivation behavior** will be investigated in a microbalance reactor. Operating condition effects, including the sulfur content that depends on the performance of the gasification step, will be determined. Together with catalyst characterization techniques an integrated, quantitative picture will be obtained on reforming catalysis, e.g., by establishing quantitative structure activity relationships.

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