



PPP Project Annual Report 2018

The PPP-projects that have been established under the direction of the top sectors must submit an annual report on their technical and financial progress. This format is to be used for reporting the technical progress. A separate format ('PPP final report') is available for PPP-projects that have been completed in 2018.

The annual reports will be published in full on the websites of the TKIs/top sector, excluding the blocks 'Approval coordinator/consortium' and 'Planning and progress' . Please ensure that no confidential matters are left in the remaining blocks.

The PPP Project Annual Reports must be submitted by 15 February 2019 to Hans van der Kolk

General information	
PPP number	TKI-AF 17029
Title	<i>Production and evaluation of furanic intermediates and aromatic derivatives from biomass (FIAD 2.0)</i>
Theme	Circulair
Executive knowledge institution(s)	Wageningen Food and Biobased Research (Wageningen) and TNO (Delft)
Research project leader (name + e-mail address)	Shanmugam Thiyagarajan (shanmugam.thiyagarajan@wur.nl)
Coordinator (on behalf of private parties)	Dr. J. van Haveren
Government contact person	Jan van Esch
Total project size (k€)	360
Address project website	https://topsectoragrifood.nl/type-project/tki/af-17029-production-and-evaluation-of-furanic-intermediates-and-aromatic-derivatives-from-biomass/
Start date	01-Oct-2018
End date	31-12-2020

Approval coordinator/consortium

The annual report should be discussed with the coordinator/the consortium. The TKIs appreciate being informed of possible feedback on the annual report.

The coordinator has assessed the annual report on behalf of the consortium:	<input checked="" type="checkbox"/> approved <input type="checkbox"/> rejected
Possible feedback on the annual report:	

Short content description/aim PPS

What is going on and how is this project involved?

What will be delivered by the project and what is the effect of this?

The FIAD2 is a continuation of the previous FIAD project (ended in 2017). The FIAD resulted in the development of versatile generic technology for the production of (near)drop-in aromatic molecules for example hemimellitic acid (HMA) in particular. This prompted to continue further as FIAD 2.0 for the production of HMA in the larger sample size for further evaluation in the application testing.

The main goals of FIAD2 is to develop scalable, Hydrazone-based, Diels-Alder technology for the production of hemi-mellitic acid (HMA).

Specific objectives of the project includes:

- to apply continuous production technologies for each of the different chemical reactions required to convert furfural, a bulk chemical which is currently produced from agricultural side streams, into HMA;
- to assess the impact of the quality of furfural on the purity of the end-product HMA;

- to supply several samples at 2-10 kilogram scale to the industrial consortium partners (Covestro and Klueber);
- to further evaluate the potential applicability of biobased HMA in polyurethane applications and in lubricant products for the automotive sector;
- to provide feedback on required purity and undesired impurities and impurity profiles relating to the produced bio-based HMA;
- to adapt production protocols accordingly and provide additional HMA samples for application testing by Covestro and Klueber;
- to use the project results as a basis for making decisions on subsequent upscaling of the specific technology to demo scale (~50 tons/annum).

Planning and progress (if there are changes to the project plan, please explain)	
Is the PPP going according to plan?	Yes, the PPP is progressing according to the planning.
Have there been changes in the consortium/project partners?	No
Is there a delay and/or deferred delivery date?	There is no significant delay in the start of the project.
Are there any substantive bottlenecks?	The project is focused developing routes on production of HMA sample in two batches (one up to 2kg and other batch 5 kg). The batch/continuous flow reactors (Pilot Skids from TNO) will be used to produce the samples. Setting-up the skid with all the safety measures is in progress and sooner the production will start in end of February 2019. The development of catalytic oxidation process of hemi-acetal to HMA is also an important task in the project. This will result the whole production process of HMA from furfural more efficient from technology and cost effective aspects.
Are there any deviations from the projected budget?	No

Results in 2018/ so far

Give a short description of the high-lights and (most important) project deliverable in 2018 / so far and their target group

Generic oxidation technology is under development. Catalytic oxidation of hemi-acetal obtained from the hydrolysis of aromatic hydrazone (step 3) to hemimellitic acid was investigated using heterogeneous catalysts as proposed. Typical oxidation catalyst like Platinum (Pt) and gold (Au) on different supports for instance carbon (C), alumina (Al₂O₃) and titania (TiO₂) were investigated. Water is used as solvent, with pressure of 20 bar oxygen. The temperature is also varied for preliminary reactions. Among the range of initial screening of different catalyst system, Au/TiO₂ showed promising results. 1mol% catalyst loading at 120 °C gave substrate conversion of 98% with high molar yield (86%) to desired hemimellitic acid in 3.0 h residence time. The obtained results are based on the preliminary reactions and still there is room for further improvements by optimization.

In the end of 2018, the pilot-skids are moved from Rotterdam to Bergen op Zoom (at the Green Chemistry Campus). This is a brand new demo-facility and preparing it for usage. Furthermore, SAT-testing needs to be done with all four pilot-skids: 2 already existing, 2 new. The new pilot-skids will be used for the sample production in the FIAD2 project. For one of those pilot-skids we experienced a setback with the delivery of the custom casing for the reactors and some additional connectors etc. required to operate the reactors. We anticipated to receive all materials by the end of January, but delivery time seems longer. Delivery is now expected by the third week of February. The production of HMA sample is expected to start sooner the pilot skid is ready by end

of February 2019.

Number of delivered products in 2018 / so far <i>(in an appendix, please provide the titles and/or description of the products or a link to the products on public websites)</i>			
Academic articles	Reports	Articles in journals	Introductions/workshops

Appendix: Names of the products or a link to the products on a public website

<https://topsectoragrifood.nl/type-project/tki/af-17029-production-and-evaluation-of-furanic-intermediates-and-aromatic-derivatives-from-biomass/>

<https://www.wur.nl/nl/Onderzoek-Resultaten/Topsectoren/show/AF-17029-Production-and-evaluation-of-furanic-intermediates-and-aromatic-derivatives-from-biomass.htm>