SUSCHEM
European Technology Platform
for Sustainable Chemistry

SusChem 2017 Brokerage Event

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Green OrganoPhosphorus-Catalysed Production

RADBOUD UNIVERSITY

Radboud University

- Nijmegen, The Netherlands
- Broad, internationally oriented, student-centred university that combines excellent education with leading-edge research.
- Organic Chemistry is 1 of the 10 priority research areas of Radboud University
- Top staff includes Prof. Floris Rutjes and Prof. Wilhelm Huck
- Strong competence of creating successful spinoff companies related to organic chemistry: MercaChem; Synthon; FutureChemistry, Synaffix; Protinhi

Radboud University

PROJECT IDEA: GREEN ORGANOPHOSPHORUS-CATALYSED PRODUCTION

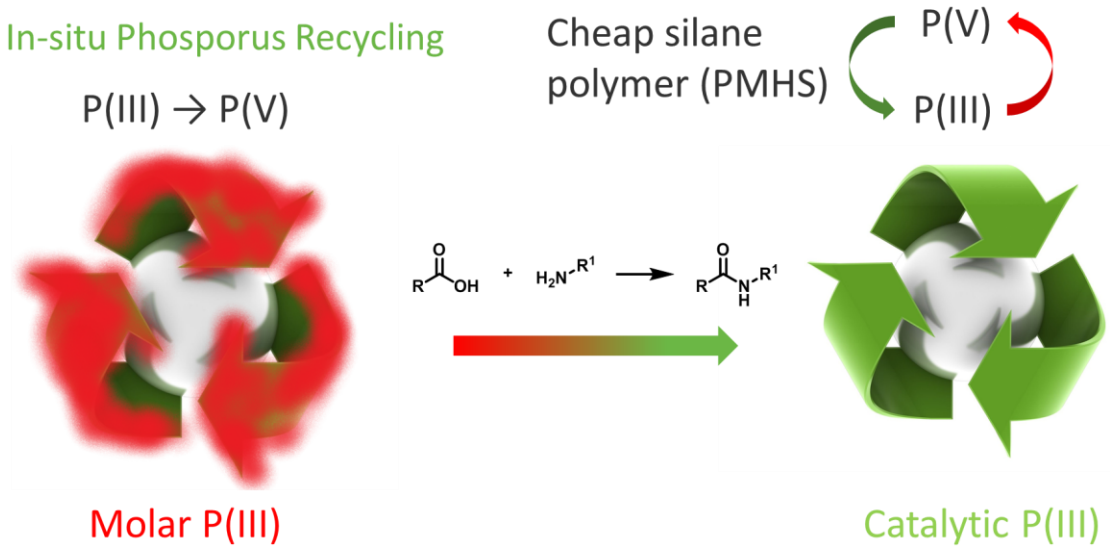
- Problem: Phosphorus (III) is a critical raw material, consumed in stoichiometric amounts in many large scale chemical processes.
- The Idea: Green version of organophosphorus-mediated amide synthesis (from carboxylic acid + amine)
- By applying PMHS (Poly(MethylHydroxoSilane)), a silane polymer, as an in-situ reducing agent to regenerate the organophosphorus catalyst → Introducing a catalytic cycle →
- In-situ recycling of phosphorus (V) to phosphorus (III) → reduces the required volume of P(III) to catalytic amounts.

Relevant H2020 calls:

- H2020 Societal Challenges – Climate Action, Environment, resource Efficiency and Raw Materials – Greening the economy in line with the SDGs.
- H2020 Industrial Leadership - Nanotechnologies, Advanced materials, advanced manufacturing and processing, and biotechnology – Industry in the circular economy

EXPECTED IMPACT

- Phosphorus (III) is a critical raw material. The earth's amount of phosphorus (III) is limited, we may run out of phosphorus in approximately 80 years.
- PMHS (reducing agent) is (i) cheap, (ii) environmentally friendly and (iii) a waste product of the silicon industry
- So: Using a waste product to save critical raw material consumption !!



LOOKING FOR PARTNERS

For validation of the concept for amide production on pilot and larger industrial scale

And determination of the application of the catalytic process on other optional reactions types (Wittig; Appel; Staudinger; Mitsunobu)

- Technical Universities with chemical engineering expertise and pilot plant facilities
- Chemical companies working with stoichiometric phosphine-mediated Mitsunobu, Staudinger, Appel, Wittig or amide forming reactions on large scale, e.g.:
  - DSM (multiple Wittig reactions, Vitamin D)
  - BASF (Wittig reactions, Vitamin A)
  - Novasep (Mitsunobu reactions)
  - Alcami (Mitsunobu reactions)
  - Lundbeck (Wittig reaction, Nalmefene)

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Contact details for project idea(s) : –

antoine.wellink@ru.nl