

Master thesis:

Evaluation of Sustainability Aspects for the Selection of Green Solvents in Pharmaceutical API Production

Background

The pharmaceutical industry is increasingly pushing sustainability and the reduction of environmental impacts in its production processes. As these processes typically need substantial quantities of solvents, reduction of solvents usage and the proper choice of solvents used in the synthesis of Active Pharmaceutical Ingredients (APIs) have become focus areas.

The current solvent selection can be enhanced by incorporating additional sustainability metrics to select solvents with benefits regarding sustainability aspects. This thesis aims to explore strategies for selecting “green solvents” that align with sustainability goals, ultimately contributing to a more environmentally responsible pharmaceutical production process.

The primary objective of this thesis is to develop a comprehensive framework for selecting green solvents in API production that integrates key sustainability aspects. This will involve identifying relevant metrics and properties that can assist chemists in making informed and responsible decisions about solvent selection. The study will also investigate the applicability of alternative green solvents and their feasibility for using them in large-scale production.

Work Packages:

1. Literature Review

- Conduct an extensive review of the current literature on green solvents and their applications in pharmaceutical production. This will include an analysis of the properties that define a solvent as "green", the implications of these properties for environmental sustainability as well as an approximation of a time to market
- Examine existing sustainability metrics, such as the Green Score and Carbon Backpack, to understand how they can be applied to solvent selection.

2. Assessment of Sustainability Metrics

- Investigate additional sustainability attributes that should be considered when selecting solvents, focusing on:
 - The recyclability of solvents and the methodologies available for assessing this characteristic.
 - The potential for sourcing solvents from renewable resources and the significance of this aspect for enhancing sustainability.
 - Estimation of availability and price

3. Framework Development

- Design a practical framework for selecting green solvents that incorporates the identified sustainability metrics and properties. This framework will serve as a guide for chemists, enabling them to utilize an existing solvent selection tool more effectively in their decision-making processes

4. Case Studies and Practical Applications

- Analyze real-world case studies (predictively oder retro-perspectively) where solvent selection has been pivotal in pharmaceutical processes, focusing on the outcomes and identifying areas for improvement in terms of sustainability.
- Discuss how the proposed framework can be applied in practice, providing chemists with actionable insights to enhance the sustainability of their solvent choices.

5. Outlook

- Reflect on the long-term implications of integrating sustainability considerations into solvent selection and the potential influence this may have on the future of pharmaceutical production practices over the next 5-10 years.

WHO YOU ARE

- A strong foundation in chemistry or a related field (with a solid understanding of organic chemistry and solvent properties) with general process engineering know how or a strong foundation in process engineering with a general chemical know how.
- An interest in sustainability and familiarity with relevant concepts and metrics in the chemical industry.
- Strong analytical and research skills, with the ability to critically evaluate existing tools and propose meaningful enhancements.
- Excellent written and verbal communication skills in English, with the capability to convey complex information clearly and effectively.

INVITE is committed to fostering an inclusive and diverse workplace and therefore encourages applications from qualified candidates of all genders and backgrounds.

INTERESTED?

We look forward to receiving your application! Please send your documents (CV, short cover letter, relevant certificates) to: Maja Diebig-Lorenz at diebig-lorenz@invite-research.com