



The concept of sustainable chemistry: Key drivers for the transition towards sustainable development



Christopher Blum^{a,*}, Dirk Bunke^b, Maximilian Hungsberg^c, Elsbeth Roelofs^d, Anke Joas^e, Reinhard Joas^e, Markus Blepp^b, Hans-Christian Stolzenberg^a

^a Umweltbundesamt, Dessau, Germany

^b Oeko-Institut, Freiburg, Germany

^c TU Darmstadt, Darmstadt, Germany

^d CSR Netherlands, Utrecht, The Netherlands

^e BIPRO GmbH, München, Germany

ARTICLE INFO

Keywords:

Sustainable chemistry
Green chemistry
Chemicals safety
Chemicals management
Sustainable development
Sustainable development goals

ABSTRACT

To achieve and safeguard the chemicals management “2020 goal” of least possible adverse effects, we need broad and global transformation to a sustainable chemistry, which can provide the most adequate solutions contributing to sustainable development as set out in the Agenda 2030. As a basis for effective progress, a common understanding is required of sustainable chemistry, of its scope, characteristic elements, and specific objectives, as well as guidelines requisite for influencing the speed and direction of this complex and encompassing transformation. This article aims at stimulating this transition process towards a sustainable chemical sector by proposing “100 words for sustainable chemistry”, objectives and guiding principles as well as actions steps towards the further implementation of sustainable chemistry.

1. Executive summary

Producing, using, re-using, disposing, and eliminating chemicals with the least possible adverse effects on human health and the environment is a global goal. This so-called 2020 goal has been initially formulated 2002 by the Johannesburg World Summit for Sustainable Development. Since then, several policy for a have repeatedly endorsed and reinforced the 2020 goal. While rapidly approaching the initial target date, we face globally ongoing progression of production volumes, count, and uses of chemicals. Thus, despite all considerable efforts in chemicals management so far, the need for broad transformation to a sustainable chemistry becomes exigent. Moreover, as humankind has to rely on the chemicals sector for contributions to nearly all Sustainable Development Goals (SDG) of the Agenda 2030, it is even more essential to get the urgently needed sustainable solutions from a thoroughly sustainable chemistry.

The herewith-presented Concept of Sustainable Chemistry describes the understanding of what sustainable chemistry is about in view of the authors. Furthermore, it is setting out the objectives and guiding principles for sustainable chemistry and points out action topics influencing the holistic approach that sustainable chemistry entails.

Sustainable development is a process to ensure the future as well as present potential to meet essential human needs and desires within the ecological and resource limits of our planet. This paradigm is relevant for all areas including those where chemicals are produced, traded, used, processed, incorporated into products, reused and recycled, disposed off and released into the environment. These chemical relevant areas need to reach a common understanding of how to foster sustainability in chemistry since the term sustainable chemistry has been used with different interpretations for many years. In order to guide this process, we propose a description of sustainable chemistry which is building on the sustainable chemistry definition of the OECD, rooted in chemicals management as well as the 12 Principles of Green Chemistry and addresses social, environmental, scientific and economical aspects (Fig. 1).

Sustainable chemistry is a holistic approach where the entire lifecycle of chemical products and the related system of actors, institutions and culture is considered. This implicates that all stakeholders along the life cycle chain of chemicals have responsible roles. Besides health and environment, social conditions, research, science and economic aspects have to be considered and balanced within the capacity-limits of our planet. This holistic approach distinguishes sustainable chemistry from green chemistry and from operational safe

* Corresponding author.

E-mail address: christopher.blum@uba.de (C. Blum).



Fig. 1. Sustainable chemistry in 100 words.

use of chemicals. Sustainable chemistry is building on and goes beyond these two concepts. Moreover, this encompasses system innovations which will lead to fundamental changes in both social dimensions (values, regulations, attitudes etc.) and technical dimensions (infrastructure, technology, tools, production processes etc.) and, very importantly, in the relations between them.

Sustainable chemistry thrives innovative solutions, even including non-chemical alternatives, based on knowledge to address serious societal problems and is able to preserve and create jobs and to access new business markets. It generates sustainable products or services which are commercially successful, beneficial to society, and not harmful to humans and environment. This implies the need for sustainable production in which steps before or after production have to be included in sustainable assessment and action.

Sustainable chemistry applies the precautionary principle and uses

or applies only products and services that are sustainable and serve sustainable objectives. Based on this assumption, to guard against green washing, to reduce current burdens, and with a view to the SDGs, we propose seven Objectives and Guiding Principles of Sustainable Chemistry to be applied in all chemical relevant areas:

- Design and use of benign chemicals.
- Development and use of alternative solutions for problematic applications.
- Reduction of impacts.
- Conservation of natural resources.
- Promotion of reuse and recycling.
- Increase of market opportunities.
- Application of corporate social responsibility.

Download English Version:

<https://daneshyari.com/en/article/5752168>

Download Persian Version:

<https://daneshyari.com/article/5752168>

[Daneshyari.com](https://daneshyari.com)