More than Recycling – Potentials and Challenges of a Circular Economy for Metals

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Abstract

The extraction and processing of resources is directly linked to 50% of all man-made climate impacts and 90% of biodiversity loss. The promotion of resource efficiency is therefore recognized worldwide as a solution to counteract this rapid development.

The Circular Economy (CE) approach brings new dynamics to the discussion about the well-known concept of resource efficiency. Both approaches aim to reduce resource use and thus prevent far-reaching environmental impacts. For example, CE is considered critical to achieving climate neutrality by 2050 and to decoupling economic growth from resource use (European Commission, 2020). Studies estimate that eco-design, waste prevention and reuse can lead to savings of up to EUR 600 billion for companies in Europe.

The metal industry is of great importance in this discussion, as metal production is responsible for 8% of global energy expenditure (UNEP 2013). Steel production alone is responsible for a quarter of all industrial greenhouse gas emissions (Allwood et al., 2011; Ito et al., 2020). However, the metals industry has a long history of recycling as a core CE principle, which has led to large resource savings. Nevertheless, there is great doubt that future metal production can be fully met by secondary materials. This is due to the dependence of the recycling infrastructure on primary metallurgy, the limitations of recycling, and the low degree of recyclability.

The presentation will introduce the challenges of resource utilization in general as well as the possible strategies of the Circular Economy and discuss their applicability to the field of metals. For illustration purposes, project examples are presented in which, on the one hand, the CE strategies of re-purposing/re-manufacturing and, on the other hand, a technical approach of single-variety sorting for recycling are presented.