

(precious metals) and their specific life cycle structure is given. Waste products of one life cycle can offer valuable materials for another life cycle. Dedicated material selection problems are solved, including for example the CO₂ footprint. This will lead to a common knowledge on recycling, the scarcity debate and other related environmental and climate related issues. This in line with the European climate ambition to be net CO₂ neutral by 2050.

Contents

- Introduction on the different material groups and their properties. Link between material processing, structure, properties and performance.
- Significance of special and precious metals. Relation with sustainable energy transition (wind energy, solar energy). Scarcity debate
- Opportunities and challenges for recovering valuable materials. Factors determining recycling efficiency for technology materials. Significance of life cycle structures.
- Materials selection for light weight vehicles. Overview of different materials available (metals, polymers, ceramics, composites)
- Introduction on life cycle analysis and exercises on sustainable materials selection taking into account eco-properties such as CO₂ footprint. The aluminum life cycle as an example of cradle to cradle life cycle.
- Recycling and life cycle issues for lightweight vehicles. Overview terminology. Complexity of the recycling process, overview of available and advanced recycling technologies.
- Difficulties in lightweight materials recycling. Effect of presence of coatings. Difficulties in recycling polymer matrix composites
- Sustainable use of materials in function of their life span in the use phase. Lifetime extension, ecological and economic impact, material integrity and degradation. Energy transition.

Initial competences

Basics on chemistry and physics as lectured in the bachelor

Final competences

- 1 Understanding the impact of material properties on the material selection process during design and how this affects the recyclability of the final product
- 2 Knowledge on advanced recycling technologies and how material properties can be used during recycling as well
- 3 Understanding the difference between the recyclability of special/precious metals and bulk materials. Insights in complete life cycle, importance of material's life span and the role of recycling in life cycle analysis
- 4 Being able to enter a broad societal discussion concerning environmental issues, recycling and material scarcity

Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Seminar, Lecture

Study material

None

References

Course content-related study coaching

Assessment moments

end-of-term assessment

Examination methods in case of periodic assessment during the first examination period

Written assessment

Examination methods in case of periodic assessment during the second examination period

Written assessment

Examination methods in case of permanent assessment

Possibilities of retake in case of permanent assessment

not applicable

Extra information on the examination methods

During examination period: written exam (theory + exercise)

Calculation of the examination mark