Innovative and sustainable technologies for reducing critical raw materials dependence for cleaner transportation applications (ITHACA)

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To strengthen EU competitiveness and gain the leadership in the efficient use of raw materials as foreseen in EU roadmaps towards 2050, it is mandatory to assess and develop substitution solutions aiming at replacing critical raw materials (CRMs) via sustainable processes, especially for those applications where CRMs play a vital role in strategic EU industrial sectors, such as aerospace and automotive industries.

Several restraining barriers must be overcome, mainly the risks of performance losses of the novel materials and the technological locks due to investments and material qualification costs which slow down the uptake to the market. The substitution readiness level (SRL) and the manufacturing readiness level (MRL) need thus to be clearly defined.

The aim of ITHACA was to bring together significant research (critical mass) expertise from all over Europe in the area of materials manufacturing and recycling in order to create a new research community able to identify and address the challenges in sustainable processes aimed at reducing CRMs in transportation applications. The creation of ITHACA Network served to capture and understand the current materials manufacturing scene and pump-prime activities in this area to move the sector forward.

In addition, ITHACA drew the attention of relevant stakeholders to the potential SRL of critical elements in materials for transportation applications, obtained by sustainable and cost-effective processes at laboratory and pre-industrial scales by expert CIG members from Academia, RTOs and SMEs involved in H2020 and bilateral related projects.

The scientific focus of ITHACA was on the assessment of processes for: i) the substitution of Yttrium (Y) in Thermal Barrier Coatings (TBCs) for aerospace engines, ii) the replacement of Cobalt (Co) alloys in components for combustion engines, and iii) the substitution of Platinum Group Metals (PGMs) in automotive catalysts.

Y, as the other Rare-Earth Elements (REEs), and PGMs are substitutable to a certain degree, but their substitution without performance losses is very challenging. Substitution of Co is also challenging and, in addition, recycling of Cobalt in alloys for engine parts is very difficult due to problems in Co separation.

The COST Innovators Grant ITHACA: addressed the substitution of Y, Co and PGMs critical elements in components which are strategic and vital for EU industries; demonstrated Y, Co and PGMs substitutability through sustainable and cost-effective processes; disseminated results among industrial stakeholders aiming at proving the MRL of Cu as PGMs substitute in automotive catalysts and the SRL of Y with mixed rare earth oxides (REOs) in TBCs and of Co alloys with intermetallics in combustion engines.

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