

Special Issue on ‘From Advanced Technology to Social Sciences, how to bring materials development into the Ecological Transition?’, edited by J.P. Birat, A.L. Hettinger, A. Declich, L. Kolbeinsen, A. Jo, J.R. Gyllenram and A. Jarfors

EDITORIAL

From Advanced Technology to Social Sciences, or how to bring Materials Development into the Ecological Transition?

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Received: 2 June 2025 / Accepted: 5 June 2025

Materials have resurfaced as a geopolitical issue and, at the beginning of 2025, the News are ripe with references to Rare Earth Metals, which are at the core of the international trade tensions created by the new US administration and its threats of stiff tariffs.

Four mature presentations from the 19th Society and Materials Conference (SAM-19) that took place in Jönköping University, Sweden, in May 2024, were selected for publication in this special issue of *Matériaux et Techniques*, after going through the usual peer review of the Journal.

The first article stemming from Luleå University of Technology and RMG Consulting Sweden (Magnus Ericsson and Olof Löf, *Critical materials: EU, the Nordic mining cluster and China – background and reflections*) proposes an analysis of the status of critical materials from the standpoint of resource economics. China stands tall in the world market of most materials, because they have steadily worked over the last 70 years to control the mining and/or the refining of many of them, from common metals like steel or aluminum, to the rare earth metals (REM) that the high-tech industries rely on. The paper, incidentally, explains that no less than 4 REM draw their name from the village of Ytterby in Sweden (Yttrium Y, Terbium Tb, Erbium Er, Ytterbium Yb) and that Y was actually the first REM discovered in 1794. Furthermore, 14 of the 15 REM called Lanthanides¹ were discovered in Europe (6 in Sweden – La, Ce, Tb, Ho, Er, Tm, 4 in France – Sm, Eu, Dy, Lu, 3 in Austria – Pr, Nd, Lu, 1 in Germany – Ce, 1 in Switzerland – Yb) and the last one in the United States – Pr. This goes to say that REM are not particular rare and

that they were initially mined in Europe until the continent lost interest in them and let third countries worry about mining them with the environmental burden this carries.

Then come two articles stemming from Jönköping University and devoted to the use of aluminum in automobiles (Anders E. W. Jarfors, Toni Bogdanoff and Lucia Lattanzi, *Functionally integrated castings (Giga-castings) for body in white applications: consequences for materials use and mix in automotive manufacturing*, and Lucia Lattanzi, Tomas Liljenfors, Richard Westergård and Christina Windmark, *The LISA project: opportunities and challenges of recycling automotive heat exchangers*), which look at new technology development through the filter of sustainability. One important criterium is *circularity* and both papers propose a closed-loop scenario, whereby the EoL material is fairly easily collected and brought to feed the value chain that produce either body-in-white through the Giga-Casting technology or automotive heat exchangers.

The fourth article deals with issues that are less technical and less material, but just as essential in dealing with the connection of materials with society. It stems from TU Dortmund (Ralf Kopp and Antonius Schröder, *Industry 5.0: making workers and civil society strong – a comprehensive approach for skill-based human centricity and stronger focus on social challenges*) and addresses the issue of updating the model of Industry 4.0, which is adopted by most material-centered industries in the EU, to Industry 5.0, where the focus is on the skills of the work force to promote aspects of human-centricity, sustainability and resilience. This is on-going work in the social innovation community and the article might become a landmark in its field.

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The implicit statement, in this special issue, is that further technology development, exemplified by the increase use of REMs in high-tech devices and by technologies allowing for closed-loop circularity, can promote sustainability, in a broad sense.

All four papers were published as part of this virtual Special Issue, in volume 112 No 6 (2024) of Matériaux et Techniques and in volume 113 No 2 (2025).

Cite this article as: Jean-Pierre Birat, Anne-Laure Hettlinger, Andrea Declich, Leiv Kolbeinsen, J.R. Gyllenram, Anders E.W. Jarfors, Gaël Fick, From Advanced Technology to Social Sciences, or how to bring Materials Development into the Ecological Transition? Matériaux & Techniques **113**, E1 (2025), <https://doi.org/10.1051/mattech/2025009>