The Street Value of Aerosol Technology: Enabler of a Green, Resilient and Digital Economy

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We argue that aerosol technology represents an important enabler for the transition towards a green, resilient and digital economy employing examples from our past research that are currently being adapted towards commercial application. This enabling is supported not only by reduced emissions employing novel manufacturing methods that generate less waste and are more energy-efficient but also by producing novel products for a wide range of applications, including catalysis, electronics, biotech, cosmetics, etc.

For example, the aerosol-based manufacturing (ABM) approach offers a flexible synthesis platform for a variety of materials such as mixed oxides (including polycation/high entropy oxides) that enable production of carbon neutral chemicals and fuels of non-biological origin ("solar fuels"), removal of pollutants from exhaust streams, capture of carbon dioxide, thermochemical storage of energy, advanced electrodes, electronic components & sensors, antibacterial coatings, etc. (e.g. Konstandopoulos, 2021). Furthermore, it provides a framework for the generation of particles according to specific ontologies, to be employed for biological impact studies e.g. nanoplastics, non-combustion transport derived particles, in addition to the well-known combustion generated particles (e.g. Konstandopoulos et al., 2022). The ability to precisely simulate (Syrigou et al., 2022) and control the size, morphology, and composition of aerosol particles allows for the production of highly specialized materials with unique properties.

We outline challenges and opportunities that arise in the road towards commercial applications, including gaps and needs regarding instrumentation, combination of functionalities at the particle level, scaling-up modalities, collection and/or incorporation into the final product e.g via deposition technologies and non-technical barriers (e.g. regulatory/legislative).

Aerosol technology has the potential to provide innovative solutions for clean energy, sustainable mobility, circular economy and health among other areas (Figure 1), and accelerate the transition to a green, resilient and digital economy. The development and deployment of commercial solutions requires interdisciplinary collaborations and partnerships between all actors of the ecosystem: academia, industry, and government.

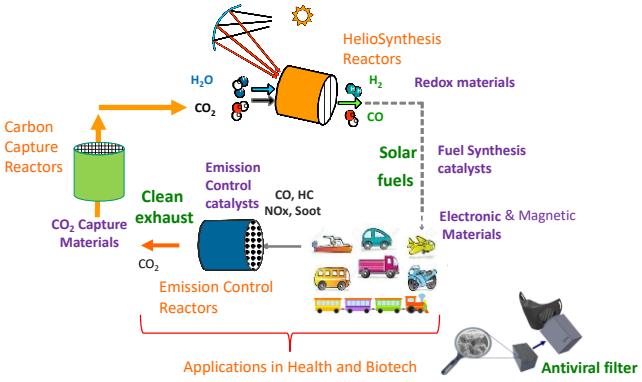

Figure 1. Some applications enabled by aerosol technology.

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