

# ORGANIC CARBONATES - GREEN SOLVENTS AND REAGENTS FOR BIO-BASED PLATFORM CHEMICALS

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The integration of basic sciences into sustainable development has become a central objective for numerous global initiatives, including the International Year of Basic Sciences for Sustainable Development and the United Nations Agenda 2030, which outlines 17 Sustainable Development Goals (SDGs). Organic synthesis plays a pivotal role in addressing sustainability challenges by emphasizing the use of non-toxic reagents, reducing energy consumption and waste, and encouraging recycling practices. These principles align with the missions of key international organizations such as the International Union of Pure and Applied Chemistry (IUPAC).

The discovery, development, and mechanistic understanding of innovative organic synthesis methods remain critical research areas. In this context, dialkyl carbonates (DACs) have attracted growing attention over the past decades due to their environmentally benign properties. Among them, dimethyl carbonate (DMC) stands out as a sustainable alternative to traditional chlorine-based reagents in various chemical transformations. Although halogenated compounds typically exhibit higher reactivity, they often suffer from poor selectivity. DACs, by contrast, offer improved selectivity in alkylation reactions, even if their reactivity is lower.[1] Green synthetic methodologies employing DMC have been successfully applied in the production of anti-inflammatory agents, polymers, fragrances, and solvents.[2] Additionally, DACs serve as fuel additives, lithium battery electrolytes, and intermediates in the synthesis of pharmaceuticals, pesticides, plastics, coatings, electronic materials, and agrochemicals.[3]

This lecture will highlight the use of DMC and related DACs as greener alternatives to halogenated reagents in the synthesis and functionalization of bio-based platform chemicals, including isosorbide, galactaric acid, and furanic compounds derived from D-fructose. The environmental performance of these synthetic procedures has been critically assessed using green chemistry metrics.

1. Tundo P., Musolino M., Aricò F., *Green Chem.*, 2018,20, 28-85.
2. Tundo P., Aricò F., *ChemSusChem*, 2023, 16, e202301712.
3. Trapasso G., Aricò F., *Green Chem.*, 2025, 27, 6925-6966.