The Third Place
Basic Research
Scientific Committee: Chemical Technologies

Research Work Title

Synthesis of Dendritic Materials and Investigation of their Catalytic Capability

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Abstract:

Dendrimers are a class of three-dimensional polymers at the nanoscale, characterized by their compact spherical structures in solution. These large, uniform, and equally sized molecules possess a well-defined branched three-dimensional architecture, comprising three main components: the core, branches, and terminal groups. Typically, dendrimers are synthesized through repetitive processes, with each cycle resulting in the formation of an additional layer of branches, known as a generation. When dendrimers are supported on insoluble inorganic surfaces or organic polymers, they are referred to as dendritic materials or immobilized dendrimers. In this project, we focus on synthetising dendritic materials, a class of novel substances that have gained significant attention due to their diverse applications in recent years. These materials serve as hosts for catalysts, including molybdenum and ruthenium complexes, as well as nanoparticles of palladium, copper, gold, bismuth, and ruthenium. They play a crucial role in catalysing various reactions, such as the oxidation of alcohols and alkenes, carbon-carbon coupling reactions, the synthesis of triazoles, and other organic transformations. Additionally, these materials have been employed as supports for the immobilization of various enzymes, including lipase for biodiesel production from edible oils, as well as xylanase, glucose oxidase, and glucoamylase for the direct conversion of glucose to gluconic acid. Due to their unique properties, dendritic materials are also utilized as nanocarriers for the smart delivery of anticancer drugs, such as 6-mercaptopurine, doxorubicin, and methotrexate, which are used in the treatment of cancerous tumors in mice, yielding promising results.