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Palladium-catalyzed telomerization reaction: from fundamentals to application

Sergio Castillón [1]

[1] Universitat Rovira i Virgili, C/ Marcel·lí Domingo s/n, 43007, Tarragona, Spain. sergio.castillon@urv.cat

Abstract

The telomerization of dienes, attractively defined as 100% atom efficient, is a transition metal catalyzed multicomponent reaction that consists in the reaction of two molecules of a diene with the subsequent addition of a nucleophile, such as an alcohol, an amine, an acid, or water, to form highly valuable intermediates. Butadiene is the most simple and widely studied diene, and butadiene telomerization is today an industrial process key for 1-octene production, and companies such as Kuraray, Dow Chemical, Oxeno, Shell or Evonik have plants for this process.

Butadiene telomerization can afford three different products, linear, branched and elimination, with the linear telomer presenting the most interesting properties (Scheme 1). However, despite the interest in the telomerization of non-symmetric dienes, this reaction has been infrequently used due to regioselectivity issues. For isoprene (2-methylbutadiene), the simplest example of non-symmetric diene, the telomerization process can yield up to 12 isomers, making this process a formidable challenge. In this case linear telomers are also the more appreciated since the C-10 products obtained are structurally related to monoterpenes that are key products in the flavors and fragrances industry.

In this communication we will discuss about the clues that allow the control of selectivity in symmetric and non-symmetric dienes.