

## ABSTRACT

A solid phosphoric acid catalyst which has high activity and attains high dimer selectivity in olefin dimerization reactions; and efficient methods of olefin dimerization reaction. The solid phosphoric acid catalyst comprises a carrier and phosphoric acid supported thereon. When the solid phosphoric acid catalyst is heated at 250°C for 20 minutes, heating loss of water is 50 mass% or more based on diphosphorus pentaoxide ( $P_2O_5$ ) derived from the phosphoric acid. One of the methods of olefin dimerization reaction comprises bringing an olefin-containing feed material containing water in an amount of 10-1000 mass ppm into contact with the catalyst to initiate the reaction. Another method of olefin dimerization reaction comprises succesively conducting the following steps: a step (1) in which a hydrocarbon containing water in an amount of 10-1000 mass ppm and containing substantially no olefin is brought into contact with the above mentioned catalyst; a step (2) in which the pressure and temperature are regulated to conditions suitable for the initiation of olefin dimerization reaction; and a step (3) in which the hydrocarbon is displaced with an olefin-containing feed material containing water in an amount of 10-1000 mass ppm to bring the olefin into contact with the solid phosphoric acid catalyst and thereby to initiate the reaction.

Still another method is the olefin dimerization reaction method described above wherein the temperature in the reaction initiation conditions is higher by 5-50°C than the reaction temperature in olefin dimerization in a stationary state after the step(3).