

Abstract

The present invention provides a process for producing methacrolein and methacrylic acid by subjecting at least one material selected from isobutylene, t-butanol and methyl t-butyl ether to gas phase catalytic oxidation with molecular oxygen or a molecular oxygen-containing gas using a fixed bed multi-tubular reactor.

The process is characterized by the following (X), (A) and (Y).

(X) There are used, as catalysts, compound oxides represented by the following general formula (I)



(in the formula, Mo represents molybdenum, W represents tungsten, Bi represents bismuth, Fe represents iron, A represents at least one element selected from nickel and cobalt, B represents at least one element selected from alkali metals and thallium, C represents at least one element selected from alkaline earth metals, D represents at least one element selected from phosphorus, tellurium, antimony, tin, cerium, lead, niobium, manganese, arsenic and zinc, E represents at least one element selected from silicon, aluminum, titanium and zirconium, and O represents oxygen; a, b, c, d, e, f, g, h, i and x represent the numbers of atoms of Mo, W, Bi, Fe, A, B, C, D, E and O, respectively; when a is 12, b = 0-10, c = 0.1-20, d = 0.1-20, e = 2-20, f = 0-10, g = 0-10, h = 0-4, i = 0-30 and x = a value determined by the oxidation states of individual elements).

(A) Each reaction tube has a plurality of reaction zones formed by dividing the catalyst layer in the reaction tube into two or more portions in the axial direction of the tube.

(Y) The plurality of reaction zones are filled with catalysts shown in the above (X) having different activities, prepared by varying the types and/or amounts of the elements constituting the A group, B group, C



group, D group and E group in the general formula (I) and/or with catalysts shown in the above ( $\alpha$ ) having different activities, prepared by varying the amount of at least one element of W, Bi and Fe in the general formula (I), in such a way that the activity of filled catalyst becomes higher as a material gas proceeds from the inlet to the outlet.

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