Title (en)

METHOD FOR OXIDATIVELY DEHYDROGENATING N-BUTENES INTO 1,3-BUTADIENE

Title (de)

VERFAHREN ZUR OXIDATIVEN DEHYDRIERUNG VON N-BUTENEN ZU 1,3-BUTADIEN

Title (fr)

PROCÉDÉ DE DÉSHYDROGÉNATION OXYDATIVE DE N-BUTÈNES EN 1,3-BUTADIÈNE

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Abstract (en)

[origin: WO2015007839A1] The invention relates to a method for oxidatively dehydrogenating n-butenes into 1,3-butadiene in a fixed-bed reactor (R), comprising at least two production steps (i) and at least one regeneration step (ii). In a production step (i), a starting gas mixture (1) containing the n-butenes is mixed with a gas (2) containing oxygen and is brought in contact with a heterogeneous, particulate multi-metal oxide catalyst, which contains molybdenum and at least one further metal as an active mass, in the fixed-bed reactor (R). In a regeneration step (ii), the heterogeneous, particulate multi-metal oxide catalyst, which contains molybdenum and at least one further metal as an active mass, is regenerated by passing a regenerating gas mixture containing oxygen over the multi-metal oxide catalyst and burning off the coke deposited on the multi-metal oxide catalyst. A regeneration step (ii) is performed between two production steps (i). In the production step (i), a product gas flow (6) is obtained in the fixed-bed reactor (R), which product gas flow contains 1,3-butadiene and also not yet reacted n-butenes, oxygen, water, and further secondary components, in particular carbon monoxide, carbon dioxide, inert gases, in particular nitrogen, high-boiling hydrocarbons, i.e., hydrocarbons having a boiling point of 95 °C or greater at a pressure of one atmosphere, possibly hydrogen, and possibly oxygenates and which product gas flow is fed to an absorption column (K) as such or, after one or more intermediate steps, as a flow (11), in which absorption column absorption is performed at a pressure in the range of 3.5 to 20 bar by means of a high-boiling absorbent (13), which loads itself with the C4 hydrocarbons from the product gas flow (6) or the flow (11) and is drawn from the bottom of the absorption column (K) as a loaded solvent flow (14), a top flow (12) thus being obtained, which contains oxygen, low-boiling hydrocarbons, i.e., hydrocarbons having a boiling point of less than 95 °C at a pressure of one atmosphere, remainders of C4 hydrocarbons, remainders of high-boiling hydrocarbons, i.e., hydrocarbons having a boiling point of 95 °C or greater at a pressure of one atmosphere, possibly inert gases, in particular nitrogen, possibly carbon oxides, and possibly water vapor and which is partially or completely recycled into the fixed-bed reactor (R) as a return flow. The method is characterized in that supply of the gas (2) containing oxygen to the reactor (R) is throttled or shut off at the end of each production step (i), and the production step (i) is continued until the oxygen concentration in the top flow (12) decreases to 5 vol. % with respect to the total volume of the top flow (12), whereupon the supply of the gas flow (1) containing the n-butenes is shut off, and also the supply of the gas (2) containing oxygen is shut off, if the supply of the gas containing oxygen was not already shut off at the end of the production step (i), whereby the production step (i) is ended and the regeneration step (ii) is started, in that the top flow (12) from the absorption column (K) acts as an oxygen-containing regenerating gas mixture or partial flow of the oxygen-containing regenerating gas mixture.

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