

Abstract

The present invention relates to a distillate two-phase hydrogenation reactor and a hydrogenation method. The size of an upper space of the reactor is greater than that of a lower catalyst bed part. The reactor comprises 2 to 4 catalyst beds. An inner component for gas replenishment and for stripping a liquid-phase stream containing impurities is arranged between at least one adjacent catalyst bed. The inner component comprises a gas-liquid contact component and a stripping component. The gas-liquid contact component and the stripping component are arranged together. The inner component comprises a separator plate and exhaust pipes. The separator plate is provided with multiple downcomer through holes. The separator plate is connected with a plurality of exhaust pipes. The exhaust pipes are vertically arranged above the separator plate. The top parts of the exhaust pipes are in contact with the lower part of the upper catalyst bed. The present reactor effectively replenishes hydrogen gas in a liquid-phase raw material, forms a gas-liquid countercurrent on the catalyst beds, increases the concentration of hydrogen gas, removes hydrogen sulfide and ammonia produced by the reaction, reduces inhibitory effects of H_2S and NH_3 on a subsequent hydrogenation reaction, enhances hydrogenation efficiency, improves raw material applicability, and reduces equipment investment and operation costs.