Production of anhydrous formaldehyde with co-generation of hydrogen

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Abstract

In response to the evolving needs of the chemical industry, enhancing the efficiency of its processes has become a matter of the utmost importance. For this reason, there has been ongoing research into more high-performing production routes, one of which is the direct dehydrogenation of methanol to formaldehyde. As stated in literature [1,2], sodium vapour is one of the most potent catalysts for the synthesis of anhydrous formaldehyde with the co-generation of highly valuable hydrogen gas [3]. Nonetheless, no further scaling-up has been implemented to this point. Thus, a mini-plant called MEDENA ('Methanol dehydrogenation with evaporated sodium [Na] as catalyst') is assembled. The MEDENA setup aims to develop an economical and sustainable solution to obtain water-free formaldehyde. This contribution will outline the influence on the chemical reaction efficiency of different reactor types, including the insertion of ceramic sponges in the apparatus with their various dimensions and porosities and their enhancing effect on the mixing of the gases and the heat transfer. Furthermore, for the purpose of providing a continuous sodium vapour supply for the reaction, this work will elaborate on the experimental demonstration of the catalyst dosing system, which may be used to provide a controlled amount of evaporated sodium as well as a constant catalyst distribution over time.

Literature

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