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New methyl formate synthesis method: coal to methyl formateLingyun Rong^{a,b}, Zhongning Xu^{a,b,*}, Jing Sun^a, Guocong Guo^{a,*}

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Abstract

Methyl formate is one of the most important intermediates in C1 chemistry, which has been employed in a wide range of industrial applications. Current synthesis methods for methyl formate mainly include esterification of methanol and formic acid, liquid-phase methanol carbonylation, oxidative dehydrogenation of methanol, one-step syngas synthesis, and carbon dioxide hydrogenation and condensation with methanol. Liquid-phase methanol carbonylation is currently a main commercially viable process developed by BASF Corp. for the industrial production of methyl formate. Recently, Fujian Institute of Research on the Structure of Matter, Chinese Academy of Sciences has developed a new synthesis method to convert coal to methyl formate (denoted as CTMF). Different from the liquid-phase methanol carbonylation using homogeneous catalysts, CTMF method features with vapor-phase methanol carbonylation using heterogeneous nanocatalysts, which can effectively utilize the coal-based syngas and produce value-added fine chemicals (i.e., methyl formate). The newly developed method not only provides a new methyl formate synthesis technology but also contributes to the development of strategies for synthesizing valuable chemicals from coal. In this review, we firstly provide introduction on the development of existing methyl formate synthesis methods and then highlight the research progress of CTMF method. Finally, a perspective on the future of CTMF is given.

Key words: Methyl formate; Coal to methyl formate; Vapor-phase methanol carbonylation; Nanocatalyst

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