

- *Highlights from DICP*

**Significant Breakthrough in Industrial Test of the “Methanol to Olefins”  
Process Developed by Dalian Institute of Chemical Physics,  
Chinese Academy of Sciences**

A process of “Methanol or Dimethylether to Olefins” developed by Dalian Institute of Chemical Physics (DICP), designated as the DMTO process, has attained great success in industrial scaling up testing. DICP, by collaborating with the Xinxing Coal Chemical Co., Ltd. of Shaanxi Province and the Luoyang Petrochemical Engineering Co. of the SINOPEC Group, operated successfully a 50t(methanol)/d unit for the conversion of methanol to lower olefins, with a methanol conversion of close to 100%, and a selectivity to lower olefins(ethylene, propylene and butylenes) of higher than 90%. On 23rd August, the industrial test project has passed a state appraisal. The experts of the Appraisal Group, headed by Prof. YUAN Qingtang, academician of Chinese Academy of Engineering, drew the conclusions that the DMTO process, by utilizing a proprietary SAPO-34 catalyst system and a recycling fluidized bed reaction system for the production of lower olefins from methanol, is the first unit in the world having a capacity of producing nearly ten thousand tons lower olefins per year. The technological level of the industrial test is at a leading position internationally. This accomplishment will provide a sound base for the subsequent commercialization of the DMTO process.



**Figure. DMTO demo plant**

On 24th August, a press conference for the success accomplishment of the DMTO industrial test was held at the People’s Congress Hall of Beijing. Top officials of China, including GU Xiulian, Vice-Chairperson of the National People’s Congress, LU Yongxiang, Vice-Chairman of the National People’s Congress and President of CAS, ZHANG Rongming, Vice-Chairman of the Chinese People’s Political Consultative Conference, YUAN Chunqing, Acting Governor of the Shaanxi Province, HONG Feng, Vice-Governor of the Shaanxi Province, and SHI Erwai, Vice-President of CAS, attended the press conference. Officials of the State Commission of Development & Reformation, as well as Prof. HUANG Xiangyang, Deputy Director of DICP, were also present at the conference.

Prof. LIU Zhongmin, technological director of the program, remarked that light alkenes, such as ethylene and propylene, are important and basic chemical intermediates that are necessary for the production of plastics, synthetic fibers, *etc.*

However, naphtha, a predominant feedstock for the production of light olefins, is mainly obtained from petroleum sources. At present, China’s petroleum demand exceeds the domestic oil production ability, and approximately 40% of China’s crude oil relies on importation. With the soaring of oil

prices in the world market, which have broken the barrier of US\$70/barrel, researches aiming at the seeking of alternative sources of feedstocks for the production of ethylene and propylene become an urgent necessity, which are also closely related to the problem of national energy safety.

As the technologies for producing synthesis gas from natural gas or coal and for the subsequent synthesizing of methanol become increasingly mature, the production of light alkenes from natural gas or coal *via* methanol as an intermediate material turns out to be an attractive approach. The core technology of this approach is the methanol to olefin process.

In recent years, by considering the situation of insufficient domestic crude oil production and increasing quantities of oil imports, the Chinese government has brought forward the strategy of promoting developments on coal-based technologies for methanol, ethanol, dimethyl ether and fuel oil productions. This strategic consideration of the Chinese government gives great impetus to the development of the MTO (Methanol To Olefin) technology in China, since it is a unique process for realizing the national strategy of "Substituting Crude by Coal". It is anticipated that ethylene and propylene derived *via* the MTO process, as well as the related downstream products of acetic acid, glycol, acrylic acid, polyethylene, polypropylene, *etc.*, will have a large market and great economic potentialities.

Accordingly, the relevant government departments of China and the Chinese Academy of Sciences are regarding researches for the production of light olefins from non-petroleum sources as key programs to be supported vigorously, which can be traced back to the time as early as the 6th "Five-year Plan". Being aware of the urgent needs of the country, DICP has conducted R&D for the production of light alkenes from natural gas or coal since the early 1980's. DICP researchers have accomplished successfully screening, preparing and scaling up of novel catalysts for the MTO process, as well as process testing in both fixed bed and fluidized bed reactor systems, especially with encouraging breakthroughs in core technologies of catalyst and reaction engineering.

Although in mid-1990's, DICP had performed a successful pilot test of the MTO process, this technology was not pushed forward further to the commercialization stage due to the low crude oil prices at that time, making the coal-based MTO process not an economically feasible candidate.

However, DICP researchers have not given up efforts to achieve commercialization of this process. In Aug. 2004, a DMTO demo unit of 50 t/d was commissioned successfully in China. The DMTO unit utilized proprietary catalysts and a circulating fluidized bed reaction system developed by DICP. The equipment and construction of the DMTO plant were invested and operated by the Xinxing Coal Chemical Co., Ltd. of the Shaanxi Province, and the engineering design of the DMTO plant was conducted by the Luoyang Petrochemical Engineering Corporation of the SINOPEC Group. After two years' collaboration, DICP and the two collaboration partners mentioned above have operated the DMTO plant very successfully, with operating data fulfilling all the indices anticipated by the designed targets. As a result, basic data for the designing and constructing of large-scale commercial units were obtained, which will provide a sound base for the designing of commercial scale technology packages for the DMTO process.

Presently, a leading group for directing research projects aiming at the commercialization of the DMTO process has been established in DICP. The State Development & Reform Commission of China and the Chinese Academy of Sciences are also rendering great supports to these DICP projects, so as to accelerate an early realization of commercializing this unique and highly significant process in China and abroad.