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Preface

Increasing concern about world dependence on oil has generated a growing interest in the use of natural gas. However, the majority of these reserves are unmarketable, since they are located in remote regions. Gas transportation requires specific technological options that are very cost intensive (pipelines or gas liquefaction and cryogenic transportation—LNG). Therefore, when the commercialization of this associated gas is not economical, the option is to burn the gas in the flare in order to produce the oil. Gas flaring and ventilation represent a very important environmental problem at the global level.

The conversion of natural gas into transportation fuels such as gasoline and diesel is an alternative to the prohibitive transportation costs. The so-called gas-to-liquids technology (GTL) also enables the oil companies to comply with no-flaring regulations while significantly reducing the release of a major greenhouse gas into atmosphere. Furthermore, there is also the possibility for trading carbon credits, earned by reduced flaring to compensate for other activities that generate CO_2 emissions.

In addition, high quality transportation fuel is obtained that fulfills the most stringent emissions requirements. New standards require the production of fuels with very high quality and low level of pollutants. Fuels produced from GTL technology have undeniable advantages compared to conventional oil products, since they contain no sulfur, no nitrogen and no aromatics.

The traditional GTL technology is based on the conversion of natural gas to a synthesis gas, prior to the liquid production through the Fischer–Tropsch Synthesis (FT). Steam methane reforming (SMR) and non-catalytic partial oxidation have been the commercial technologies for producing syngas from natural gas. However, they are not suited to GTL plants due to the required H_2/CO ratio for FT synthesis. In order to overcome this problem, both technologies can be used in parallel to produce syngas streams with the desired composition. An alternative approach is the autothermal reforming (ATR), which combines partial oxidation with steam reforming in one reactor. ATR fulfills the requirements to a syngas with H_2/CO ratio of 2, the ratio necessary for GTL plant. Moreover, ATR has relative compactness, lower capital cost and greater potential for economy of scale.

Today, commercial experience on GTL technology comes from Shell in Malaysia and from Mossgas and Sasol in South Africa. Recently, two projects were announced for the production of more than 30,000 barrels/day in Nigeria and Qatar, based on ATR technology.

However, the main barrier to commercialization of GTL technology has been capital cost. The syngas generation is the most capital and energy intensive part of the production plant, responsible for 50–75% of the capital cost. Therefore, the economic viability of GTL technology depends on optimizing the process for syngas production.

Increasing efforts have been made to the development of lower-cost syngas generation technologies such as ceramic membrane reactor. An alternative to this approach is to produce liquid hydrocarbons through direct route, eliminating the high costs associated with the syngas generation step. The development of a catalyst that will not deactivate under the reaction conditions is still needed.

This special issue is devoted to the papers, concerning the GTL technology, presented at the 12th Brazilian Congress on Catalysis, held in September 2003 in Angra dos Reis – Rio de Janeiro. These selected contributions highlight the challenges regarding such technology, presenting distinct approaches to achieve its economical viability. The papers deal with different routes for syngas production, production of alternative fuels from natural gas amongst the most relevant related processes.

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Victor Teixeira da Silva
Departamento de Engenharia Química
Instituto Militar de Engenharia
Pç. General Tibúrcio 80, CEP 22290-270
Rio de Janeiro, Brazil
E-mail address: dasilva@ime.eb.br

Cláudio José de Araújo Mota
Instituto de Química
Departamento de Química Orgânica
Universidade Federal do Rio de Janeiro
Cidade Universitária, Centro de Tecnologia
bloco A, CEP 21949-900
Rio de Janeiro
Brazil

Fabio Barboza Passos
Departamento de Engenharia Química e
Programa de Pós-Graduação em Química Orgânica
Universidade Federal Fluminense
Rua Passos da Pátria, 156, Niterói, Brazil
E-mail address: fbpassos@vm.uff.br
Fax: +55 21 2717 4446

Fábio Bellot Noronha*
Instituto Nacional de Tecnologia (INT)
Laboratório de Catálise, sala 518, Av. Venezuela 82
CEP 20081-312, Rio de Janeiro, Brazil
E-mail address: fabiobel@int.gov.br
*Corresponding author

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