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我国新型煤化工产业发展概览

Overview of China's Coal Chemical Industry

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高峥女士在 2009 年新财富最佳分析师评选中获得基础化工团队第二名，2011 年 Institutional Investor A 股分析师排名中获得 2011 年 II 基础材料行业第一以及能源行业第一。高峥女士在加入中金公司前于 2007 - 2010 年服务于光大证券销售交易部和研究部。

高峥女士毕业于约翰斯·霍普金斯大学 - 南京大学中美中心和华东理工大学化工学院，分别获得金融学硕士学位和化学工程与工艺学士学位。

Ms. Gao Zheng joined CICC as chemical analyst in 2010, served as senior associate of research department. Ms. Gao Zheng won the 2nd prize of New Fortune Best Chemical Analyst in 2009.

Before she joined CICC, she worked for sales and trading department and research department of Everbright Securities Co., Ltd from 2007 to 2010. She got 1st prize among A share analysts for Basic Materials and Energy in Institutional Investor 2011.

Ms. Gao Zheng graduated from Johns Hopkins University- Nanjing University center for Chinese and American Studies and East China University of Science and Technology. She received a master degree in Finance and a bachelor degree in chemical engineering.



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高兵先生现任中国国际金融有限公司研究部经理。高兵先生于 2010 年加入中金公司，现主要负责对化工行业的研究，向国内外投资者提供研究服务。高兵先生在加入中金前曾在长信基金担任化工行业研究员。高兵先生于 2009 年毕业于清华大学化学工程系，获得工学硕士学位，同时取得证券从业资格。

Mr. Gao joined CICC in 2010 and responsible for the research of chemical industry now. Mr. Gao offers research service to domestic and overseas institutional investors. Before joining CICC Research, Mr. Gao worked in Chang Xin Fund as equity research analyst (Buy-Side). Mr. Gao obtained his Master degree in Chemical Engineering from Tsinghua University in 2009.

我国新型煤化工产业发展概览



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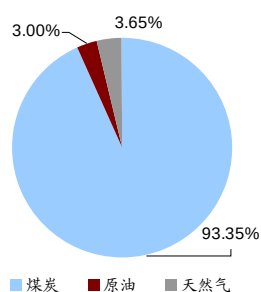
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新型煤化工产业发展概览

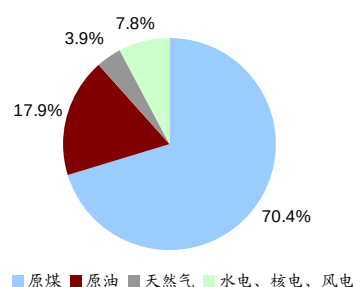
近年来，国内新型煤化工发展优势明显，技术发展迅速。相对于高价的进口原油、天然气，中国的煤炭资源相对丰富而廉价。随着现代煤化工技术的发展，以煤为原料制取石油、天然气，以及替代石油、天然气制取烯烃、乙二醇及二甲醚等下游产品的各种新型煤化工工艺在技术上已趋于成熟。

国务院2009年5月正式发布的《石化产业调整和振兴规划》，在关于稳步开展煤化工示范中提到，重点抓好现有**煤制油、煤制烯烃、煤制二甲醚、煤制甲烷气、煤制乙二醇**等五类示范工程，探索煤炭高效清洁转化和石化原料多元化发展的新途径。

2010年中国能源储量



2009年中国能源消费结构

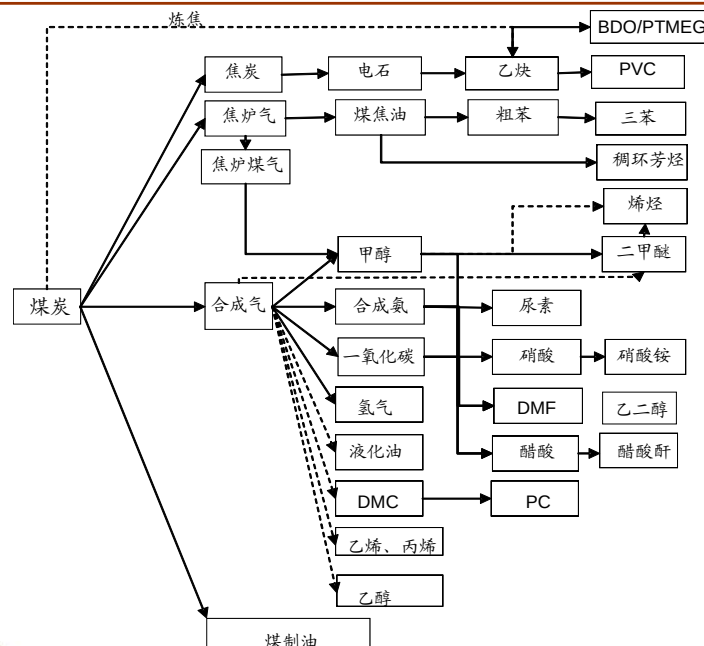


资料来源：BP StatsReview 2011，中国统计年鉴2010，中金公司研究部

1

新型煤化工产业发展概览

煤化工产业链简图



新型煤化工产业发展概览

经过近几年的发展，上述五类煤化工产业的发展情况及未来前景迥异。煤制油项目发展相对较早，目前神华等示范工程已经开始工业化运转，但是煤制油能量转化率及资源利用率优势并不明显，国家对煤制油项目的管控也较为严格。我们认为煤制油更可能适合作为战略性的技术储备，对其大规模产业化持谨慎态度。我们更关注合成油技术以生物质、焦炉气或炼厂气为原材料的技术路径，还包括现有传统甲醇厂和合成氨厂的技术改造路径。

二甲醚在我国市场主要替代液化石油气用作民用燃气和柴油掺烧剂作为公交车燃料，产能早已远远过剩。同时二甲醚作为过渡性替代燃料，下游使用前景不明朗，导致很多企业成本倒挂、经营困难。我们认为若无配套政策出台，煤制二甲醚项目的发展前景将存在很大的不确定性。

石油价格的上涨和我国石油对外依存度不断提高的双重压力，催生了我国煤制烯烃产业的兴起。目前国内煤制烯烃技术进展迅速，以大连化物所为代表的第二代DMTO技术实现了甲醇和C4同时向烯烃的高效转化。神华包头煤制烯烃示范项目运转良好，已经具有可观的盈利能力。我们认为煤制烯烃具备产业化条件，将会成为石油基制烯烃产业的有效补充。

国内聚酯产业迅猛发展，拉动乙二醇需求逐年上升。中国目前乙二醇产能有限，贸易依存度极高，发展煤制乙二醇将有助于缓解国内需求压力。但是国内的煤制乙二醇的大规模工业化技术为世界首次，工艺技术以及装置的稳定性方面还存在各种不确定性。我们认为煤制乙二醇的生产成本、工艺技术的可靠性以及装置能否实现稳定运行将是决定其竞争力的关键。

近年来随着天然气在环保及节能等方面的优势逐渐凸显，中国的天然气需求量迅速增长。然而与之对应的却是国内天然气的传统开采产量受储量有限影响无法大幅度增加，同时从中亚及俄罗斯等国进口天然气成本较高，发展煤制天然气有助于改善我国多煤少气的能源格局。煤制天然气技术相对成熟，同时一些项目已经具备可观的盈利前景。我们认为在重点地区适度、规模化发展煤制天然气项目是可行的，煤制天然气或将是液化石油天然气和常规天然气的重要替代和补充。

上述新型煤化工行业中，我们认为从供求关系、经济性及政策面等多个角度综合来看，煤制天然气、煤制乙二醇及煤制烯烃的前景较为看好。

新型煤化工产业发展概览

行业名称	技术成熟度	产品供求关系	经济性	目前投产情况	目前规划情况	政策面信息	优缺点综述	前景
煤制二甲醚	成熟，大规模投产	差。作为替代性燃料，市场不明朗；前期产能扩张太快，开工率低下。	不稳定。完全成本超过3000元，且下游需求不畅，经济性无法维持。	2010年产能超过1000万吨，实际产量仅217万吨。目前虽然价格有所恢复，但开工率仍不足50%	产能严重过剩，新项目不多	2010年国家出台政策，严禁LPG掺混二甲醚，严重打击下游需求。禁止投产年产100万吨及以下项目。	产能过剩，需求不明，开工率低下。	差
煤制天然气	较为成熟，国外有美国大平原项目，已投产20余年	良好。未来天然气需求看好，国内价格有望进一步上调。	较好。较进口天然气有成本优势，但高于国产天然气价格。	新疆庆华项目预计本年10月产气。大唐克旗、汇能鄂尔多斯项目预计12年部分投产。	规划产能超过1000亿立方，但只有4个项目共150亿立方经国家发改委批准。	禁止上马年产20亿立方米及以下项目。	成本具有一定优势，天然气整体需求看好。但投资门槛较高，管道进入困难。规划产能若全部投产将造成过剩。	良好
煤制油	较成熟，国外有南非沙索项目，已投产30余年	稳定。石油需求将保持增长，但增速预计放缓。	不明确。项目评估报告中称油价在60美元以下时，采用800元/吨的无水无灰煤价以直接液化法生产即有利可图	神华鄂尔多斯100万吨/年直接液化，潞安21万吨、伊泰16万吨间接液化三个试点项目已经投产。	神华、伊泰、潞安合计投产及规划产能约1900万吨。除已投产项目外，其他项目均在规划阶段。	禁止上马年产100万吨及以下项目；多次叫停除神华项目外煤制油。	盈利空间有限，且高能耗、高水耗，投资巨大。国家三令五申管制。一般技术储备意义大于经济意义。	一般
煤制乙二醇	丹化通辽项目已取得突破	良好。下游聚酯产业扩张迅速，需求明确且稳定增长；未来全球产能扩张有限，国内外贸易依存度畸高。	良好。丹化20万吨项目估算成本4750/吨左右，远低于石油路线成本，但高于中东乙烷路线成本。	丹化通辽金煤项目试车进展顺利，负荷良好，有望取得实质性突破	规划及在建产能近300万吨，其中丹化科技占到160万吨。丹化计划将通辽扩产至60万吨，在河南新建5个20万吨/年项目。	禁止上马年产20万吨及以下煤制乙二醇项目；20万吨及以上合成气制乙二醇项目列入鼓励项目。	市场需求稳定，供需缺口巨大。满负荷运行成本远低于国内石油裂解法成本。单项目工程规模小，投资相对较低，灵活性强。	良好
煤制烯烃	成熟，部分项目已投产	良好；烯烃下游产业链多而长，需求将保持增长；中东烯烃产能预期扩张缓慢，部分落后产能将退出。	褐煤价格400元时，烯烃成本约5900元/吨，目前乙烷进口均价约7000元/吨。	神华包头60万吨/年项目2010年试车成功，目前已进入商业运营阶段，开工及盈利情况良好。神华宁煤52万吨、大唐多伦46万吨项目目前正在试车。	目前除已建成及试车的160万吨产能外，在建的煤制烯烃产能约200万吨/年。	禁止发展年产50万吨及以下项目。	烯烃需求预计稳步增长，供给面偏紧，烯烃价格有支持，较传统路线有明显成本优势。技术稳定，神华包头项目开工率稳定，效益良好	良好

A brief introduction to new coal chemicals

Coal to oil: Some pilot projects (including those of China Shenhua) are already able to run on a large scale. However, **We believe coal-to-oil conversion in China is more likely to be just a technologically strategic move, and investors should not have high expectations for massive production.**

Coal to DME: China's DME production capacity has been far above its demand. **We believe the outlook of coal-to-DME will face great uncertainties, should there be no favorable policies.**

Coal to natural gas: China's natural gas demand has risen significantly over recent years thanks to the resource's advantages with environmental protection and energy conservation. However, domestic extraction fails to keep up due to reserve restraints, and imports from central Asia and Russia also face high costs. Coal-to-natural gas conversion will help to improve China's coal-rich and gas-poor energy structure. **We believe a moderate push for the conversion in major regions is feasible, and coal-to-natural gas will likely be an important alternative to LPG and conventional natural gas.**

Coal to MEG: EG demand has been rising year on year in China along with the strong growth of the polyester sector. With limited EG production capacity, China has to mainly rely on imports to fulfill its demand. The Chinese-developed technology for mass producing coal-to-EG is the first in the world, suggesting uncertainties will remain on the reliability of the technology and the stable performance of the facility. **We believe once technology bottleneck is overcome, coal to MEG will be of superior competitiveness.**

Coal to olefin: Rising oil prices and the increasingly higher dependence on oil imports have provided an impetus for coal-to-olefin conversion in China. The country has made good progress on the conversion technology. The second-generation DMT technology developed by Dalian Institute of Chemical Physics allows efficient olefin conversion from both methanol and C_4 . Meanwhile, Shenhua Baotou's pilot coal-to-olefin project is running smoothly, and is already able to generate lucrative profit. **In our view, conditions on coal-to-olefin industrialization will likely be ripe in China, and coal-to-olefin will be an effective complement to oil-to-olefin conversion.**

A brief introduction to new coal chemicals

Industry	Tech. maturity	Demand and supply	Economical efficiency	Current production capacity	Planned development	Policies	Overall	Outlook
Coal-to-dimethyl ether	Mature, large-scale productions.	Oversupply. The market demand is vague; low utilization rate due to excess capacity expansion in early stage.	Unstable. Full cost exceeds Rmb3000/t; weak downstream demand. Economical efficiency hard to maintain	Production capacity exceeded 10mty in 2010, while production was only 2.17mt. Although prices have recovered new projects. by some extent, the utilization rate is still below 50%.	Serious overcapacity, few new projects.	A policy prohibiting LPG mixing dimethyl ether in 2010; new projects with annual production lower than 1mt were banned.	Overcapacity, vague demand, low utilization rate.	Poor
Coal-to-gas	Relatively mature, the Great Plain project in the US has been under production for more than 20 years.	Undersupply. Optimistic on gas demand going forward, further domestic price hike expected.	Relatively good. Cheaper than imported natural gas but more expensive than domestic gas.	The Qinghua project in Xinjiang will likely come on stream by October, while Datang's Keqi projects and Huineng's Erdos projects may put into production by 2012.	Planned production capacity exceeds 100bcm, while only four projects (15bcm) were approved by NDRC.	Banned new projects with annual production less than 2bcm.	Enjoy cost advantage; demand for natural gas may grow; high entrance barrier; hard for network connection; overcapacity if all planned capacity come on stream.	Good
Coal-to-oil	Relatively mature, the Sasol project in South Africa has been under production for more than 30 years.	Balanced. Oil demand to grow, albeit at a slower pace.	Not clear. Project report said it would be profitable by direct liquefaction production with Rmb800/t dry ash-free coal when oil price below US\$60	Shenhua's 1mtpa direct liquefaction project in Erdos, Lu'an's 210ktpa and Yitai's 160ktpa indirect liquefaction projects (three pilot projects) have been put into operation.	Total production capacity and planned capacity of Shenhua, Yitai and Lu'an was about 19mtpa. Despite projects already in operation, other projects are in planning stage.	Banned new projects with annual production less than 1mt. Suspended many coal-to-oil projects (despite Shenhua's project).	Limited upside potential in earnings; high energy and water consumption; huge investment; subject to government control.	Mediocre
Coal-to-glycol	Restrained by technical bottlenecks.	Undersupply. Promising demand due to expansion in downstream polyester industry; limited global production capacity growth, high dependence on imports.	Good. The estimated cost is Rmb4k/t-5k/t for Danhua's 200ktpa project which are well below the cost by using oil but are higher than the cost by using ethane from the Middle East.	Danhua is making another trial in Nov. 2011 and some breakthrough is well-expected	Production capacity under planning or under construction was about 3mtpa, of which 1.6mtpa from Dahua. Danhua plans to expand the capacity in Tongliao to 0.6mtpa, and to build five new 0.2mtpa projects.	Banned new coal-to-glycol projects less than 200kta. Synthesis gas-to-glycol projects with annual production equal or above 200kt was listed to be encouraged.	Stable demand, heavily undersupply; full capacity production cost well below by naphtha cracking method; more flexible due to small project scale and low investment; technical bottleneck need to break.	Good
Coal-to-olefins	Mature, some projects have come on stream.	Sound. The demand for olefins may grow steadily due to wide downstream spread; limited capacity growth in Middle East, and some obsolete capacity will be eliminated.	The olefin cost is ~Rmb6300/t when lignite price is Rmb400. The current average ethylene import price is ~Rmb9000/t.	Shenhua successfully run its 600ktpa project in Baotou in 2010, which are under commercial operations now. Shenhua Ningxia's 520ktpa project and Datang's 460ktpa project in Duolun are currently under test.	In addition to the 1.6mtpa production capacity which is currently in service, the coal-to-olefins capacity under construction is about 2mtpa.	Prohibited development of projects with annual production less than 500kt.	Stable demand growth and tight supply expected going forward, supporting olefin prices; prominent advantage in cost comparing to traditional methods; mature technology and proved profitability.	Good



6

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7

