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Prof. Dr. Rainer Diercks, Member of the Board of DECHEMA e.V.

Chemical industry prepared for growth

Ladies and gentlemen,

The chemical industry has enjoyed high growth rates of more than 3% per year on average since the beginning of the century and well above 5% per year since the economic crisis in 2008-2009. This growth has been mainly a result of strongly growing economies in the emerging markets of South America and especially Asia, which since 2010 have accounted for half the global demand for chemicals. The tremendous speed of demand recovery observed after the recent crisis is mainly attributable to the continuing strong need for chemicals in countries like China and Brazil, but also to the economic stimulus packages many governments adopted.

At present the speed of growth has eased slightly. This is mainly due to China's tightened monetary policy, which has led to a distinct decline in the growth of its economy although in absolute terms growth in China is still high, and it is due to the European debt crisis – or, more precisely, the debt crisis in Southern Europe. Regardless of this, strong growth can be expected also for the coming years in the chemical industry. This growth will be driven by mega trends like population growth, urbanization, increasing mobility and strongly growing energy demand, which will produce positive effects in two ways:

- first, by increasing demand for consumer goods and, accordingly, for the chemicals needed to produce them, and
- secondly, by enhancing the chemical industry's key role as an important driver of innovation for its customer industries.

My outlook for the chemical industry is therefore positive as well.

The growth path will, however, differ considerably from region to region because the emerging markets are the main drivers of global growth in chemical demand whereas the industrial countries are expected to show only moderate growth.

This difference in market growth between emerging and established markets can best be underpinned by some facts. Emerging markets will account for more than 75% of global growth in the demand for chemicals in this decade. China will probably be the largest single market for chemicals and larger than the combined chemical markets in all industrial countries by 2020. This shows the importance of the emerging markets for the chemical industry, but also the opportunities globally active companies can derive from this to participate in this market growth.

Yet in the industrial countries of Europe and North America with their low growth expectations in terms of both chemical and overall industrial output, the development will not be consistent.

In Europe high energy-related costs lead to significant disadvantages. One part of these costs is the direct cost of electricity, gas or oil, and another part originates from the CO₂ certificate system in Europe, which imposes additional costs on all European manufacturers and impacts the competitiveness of the European chemical industry.

As an important measure, therefore, we need to optimize the integrated use of energy in production facilities. This approach not only results in cost savings via lower energy consumption, but also in reduced CO₂ emissions and, finally, in more sustainable manufacturing operations.

Unlike Europe, the chemical industry – especially the petrochemical industry – in North America is currently enjoying a significant raw material and energy cost advantage compared to most other regions in the world. The exploration of unconventional gas sources, most often known as shale gas, allows the production of large volumes of natural gas, ethane and natural gas liquids in the United States. Accordingly, current gas prices in the United States are significantly lower than in Europe, leading to lower energy costs and offering a large feedstock advantage to all producers of natural gas-based products like for example methanol or ammonia. Moreover, the large volumes of ethane obtained as a by-product in shale gas production have changed the cost position of North American cracker operators from an inferior rank to the second best topped only by operators in the Middle East. This has resulted in idled plants being restarted in North America and in a conversion from naphtha to ethane as cracker feedstock. In addition, investments to install some 11 million tons of ethylene capacity, all based on ethane, have been announced for the coming years, as well as a considerable expansion in downstream capacity for products like polyethylene and ethylene glycol.

But this shift to lighter feedstocks comes at a price. It causes a different product output pattern in steam crackers. Using a large portion of ethane as cracker feedstock allows producing nearly exclusively ethylene. Typical by-products of naphtha crackers like propylene or butadiene are produced in small amounts only in these ethane-based crackers, which has caused significant increases in the prices of propylene and especially butadiene. As a result, investments in

technologies for on-purpose propylene production have already been announced. Beyond this, innovative processes for the dedicated production of butadiene will open up new market potential. You see how the availability and pricing of raw materials may directly impact the product portfolio, cost structure and even competitiveness of an entire national economy.

Let us now look at the main challenges the chemical industry, and especially the petrochemical industry, will face in the years to come:

1. Different regional market growth
2. Raw material availability and pricing
3. Growth and competitive advantages through innovation

I already referred to the first challenge of differences in regional market growth. It will eventually lead to a concentration of major new investments in the emerging countries and to significant investments especially in the petrochemical industry in the United States based on their feedstock advantage. Europe will see lower investments, mainly dedicated to new innovative products and to process optimizations to mitigate the disadvantages on feedstock and energy prices.

As already mentioned in the case of the North American petrochemical industry, changes in raw materials affect cost positions and the use and development of chemical manufacturing technologies. Until recently oil and consequently naphtha was the main source of chemical production globally. In the early 1990s Middle Eastern petrochemical companies entered the market capitalizing on their cheap gas feedstock. Since 2005 we have observed a similar trend in North America, as I said before, with shale gas replacing naphtha as a feedstock for the petrochemical industry. In China, projects have been started in recent years to utilize the large coal reserves in this country. The country aims to build new integrated chemical complexes that rely on this “traditional” feedstock.

Apart from these changes in the use of fossil raw materials, a trend to renewable feedstocks to produce what is known as “green” chemicals is also obvious. But up to now only Brazil has proved to be competitive and successful in using renewable feedstocks for the production of commodity chemicals. Due to the availability and price of many renewable feedstocks, also very much depending on the region of production, many of these technologies are not yet economically viable and several technological challenges limit the use of renewables in chemical production.

As I see it, raw materials in the chemical industry are currently shifting from oil to gas, and potentially to coal. The latter is mainly a trend that is limited to China, and its long-term viability appears questionable in the light of higher CO₂ emissions and cost issues. In the medium term, fossil raw materials, including oil, will remain the major source for chemicals, mainly as a result of their availability and experience in the use of mature technologies. Within the coming decades we will see

chemical production based on renewables increase, but it is in my view too early to comment definitely on the global market potential those renewable-based chemicals will have in future.

This raw material change will be a gradual process with currently a slight reduction of oil-based feedstocks that will mainly be compensated by gas-based production. As a result of changes in relative raw material prices and feedstock availability in different regions of the world, choosing the optimal production technology in each region will be an important managerial decision.

As mentioned many times before, innovation will become an increasingly important differentiator in the chemical industry in the future. To me, innovation comprises the optimization of existing processes, for example by reducing input factors, the development of new processes for existing products, for example based on alternative raw materials, and the synthesis of new tailor-made products that meet the application needs of our customers.

Catalysis will be of major importance in this innovation process, as it is the key interdisciplinary technology in the chemical industry. Even today more than 80% of all chemicals are synthesized via catalyzed processes. Catalysts are a means to make many chemical reactions more cost-efficient, environmentally more sustainable or even possible in the first place. Answering the main questions of the future – reducing demand for and optimal usage of fossil and renewable resources, sustainable production of chemicals and energy, as well as a reduction of emissions of harmful substances to the environment – will only be possible with further improvements in catalysis. This is where the course will be set for both the future competitive position of companies and our response to the major social challenges that result from environmental protection and population growth.

Ladies and gentlemen, let me conclude with a brief summary: I expect the chemical industry to grow sustainably above the gross domestic product, driven on the one hand by the mega trends I referred to and the demand for chemical products and solutions that derives from them, and on the other hand by the key role our industry plays in the process of innovation as an enabler of many next generation technologies.