



CHINA: Ceramics world continues eastward shift

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Shanghai Institute of Ceramics Chinese Academy of Science building

After the Olympics, after an earthquake, after the launch of the Shenzhou 7 spacecraft (with its ceramic composite rocket engines) and its taikonauts' space walk, and after seeing skylines like the ultramodern Pu Dong section of Shanghai (above) – no one can claim to be surprised by China being an enormous world player in all things scientific, industrial, cultural and, yes, ceramic.

With an active ceramic society (see page 28), growing academic and engineering support, innovative marketing and manufacturing approaches, and strategic support for alternative sustainable energy solutions,

China is solidly among the biggest players on the worldwide ceramics scene. And, there's reason to believe the nation's influence on ceramics will only grow.

Its influence in ceramics, of course, comes with so much historical precedence. There are few nations in the world that have accumulated a field of knowledge that stretches back thousands of years.

But the scope and scale of China's influence in ceramics are far from being confined to the traditional or small-scale. It's worth first surveying where the Asian nation stands in relation to some of the major international ceramic markets.

By the end of 2007, the total assets of China's ceramic industry reached nearly 64 billion yuan (approximately \$8 billion), up 11 percent year on year. In particular, those of small companies reached 32.1 billion yuan, accounting for 50 percent of the

industry total, while those of the large companies amounted to only 10 percent of the total. Thus, China's ceramic industry has enjoyed a rapid growth, but the degree of concentration in the industry is still low.

Sanitaryware

Toilets, bidets, urinals and washbasins are the biggest ceramic sanitaryware product categories exported from China, but export sales of sinks and basins continue to grow at more than 20 percent annually.

The country's exports of ceramic sanitaryware in 2005 soared 47 percent from the same period in 2004 and has maintained a 50 percent average growth rate since 2001. The growth hasn't been too surprising with, until at least recently, Chinese suppliers of ceramic sanitaryware offering prices up to 50 percent lower than most of their foreign counterparts. Export sales will continue to grow based on demand from high-end markets such as the United States and the European Union countries, but the slowdown in housing construction is likely slowing the rate of growth.

However, export prices in sanitaryware and other ceramics products are rising with Chinese manufacturers claiming the raw materials and energy costs are going up as much as 60 percent. Makers also claim to be improving quality control standards and procedures to minimize defects and save on production expenses, but not everyone is convinced that quality improvements will actually result.

Whiteware

Whiteware exports are a major part of the ceramics industry, but internal consumption of sanitaryware and whiteware is pumping additional life into the markets. That's good news because export growth rates of China-made cookware have declined considerably in recent years. The export volume growth rate was 20 percent in 2003, but plummeted to six percent in 2004.

China's dinnerware industry will continue to face challenging times in coming months, as higher production

costs, stricter quality standards and revaluation of the yuan curb export growth. Exports of porcelain dinnerware, which took up the biggest share of China's dinnerware shipments in 2007, declined by three percent to \$451 million in the first four months of 2008. Melamine, the second-largest product category in sales and quantity, was at \$399 million, down by 10 percent.

To maintain profitability, most suppliers raised their prices in 2007, and many will push them further by five to 10 percent in 2008. An increasing number of exporters are also quoting prices in euro, which is presently more stable than the US dollar.

To attract new orders, suppliers are releasing more casual-themed dinnerware pieces, which are currently enjoying greater popularity than fine-dining designs. Upcoming products will be infused with bright colors, multiple tones, and contemporary shapes and patterns.

Cement and building materials

Cement manufacturing is the largest sector in China's building materials industry. Among China's top 100 building materials companies in 2003, 59 were cement manufacturers. There are nearly 5,000 cement firms nationwide.

China's demand for cement, concrete and aggregates has grown at a fast pace in the past decade. In the next five years, production and demand will continue to grow at unprecedented rates. National industry output has advanced at 10.3 percent annually. Despite the strong demand for cement, the central government's environment and energy policies will take some small and backward cement production lines out of market. Therefore, China may face an actual shortage of cement on the order of 145-156 million tons in the next few years.

One example of the Chinese cement industry is the Tangshan Jidong



China-made sanitaryware sales continue to grow but face escalating manufacturing costs.

Cement Co., one of the 12 largest cement groups.

Tangshan building seven new production lines that will add clinker production capacity of over 12 million tons and cement production capacity of over 13 million tons. The seven new lines will be in operation by the end of 2008, giving the company a total output of nearly 40 million tons.

But because of the continuing shortage, the company is doing quite well. In 2007, the revenue of company's main business was 3.86 billion yuan, an increase of 33 percent year-on-year and net profit of 420 million yuan, an increase of 85 percent year-on-year.

The sustainable development strategy for China's cement industry is part of the social sustainable development strategy. Rather than a net exporter, China is one of the main markets for the production and consumption of cement in the world. In 2005, China had a cement output of 1.064 billion tons, up nearly 10 percent from 2004.

The development of the global and Chinese economy will stimulate the demand for cement and the growth was expected to be approximately seven to eight percent, and the output was to be around 1.15 billion ton in 2006.

But exports of building materials are a huge factor. In 2006, the first year of the China's current Five-Year Plan, the building materials export value was as high as \$13 billion and exported to 216



Last October, the Corning Company led by CEO Eric Musser, signed a joint research contract with SICCAS for the development of thermoelectric materials.

countries and regions in 2006. Exports to U.S., Hong Kong and Japan exceeded \$1 billion, alone.

Tile

China is the largest tile industrial country in the world. In the past decade China's ceramic-tile output has been growing at an annual rate of 20 percent. According to Chinese official statistics, the total output reached 5 billion square meters by December 2007. Export accounts for 600 million

square meters, domestic consumption is 4 billion square meters and inventory turnover accounts for nearly 400 million square meters.

But, China's tile makers' exports have been slammed by the malaise in the western housing markets. The U.S. ceramic tile market plunged a record 19.5% to 2.7 billion square feet in 2007 and with increase in export related costs. Nevertheless, China stood up well to international competition and became the third largest ceramic tile supplier to the U.S.

In recent years, China's ceramic tile companies have been paying more attention to intellectual property protection and innovative designs, and, as a direct result, a large number of innovative products appeared. Many internationally renowned designers are commissioned by leading Chinese manufacturers. This growing trend is helping create more appealing and competitive products.

However, small tile producers are facing severe problems. As with the cement industry, the government is tightening environmental controls for tile production. Companies that do not comply with the new laws and

regulations will have to upgrade in the next three years or be eliminated. Some estimate that 30 percent of the tile factories may disappear. This could result in slower (or negative) growth.

Glass

The flatglass output amounted to 405 million weight cases in China in 2006, up nearly 11 percent compared to 2005, but production capacity has been increasing and the competition is also becoming fiercer as the market faces saturation.

Glass price rose slightly in the first quarter of 2008, but growth in the prices of key raw materials and energy is still high and threatens the glass sector's overall continued prosperity.

The total operating income of China's automotive glass in 2007 was 3.6 billion yuan, an increase of 23 percent year-on-year, with domestic consumption growing by 22 percent and exports rising 26 percent. Asahi Glass Co. recently announced that it will build its second automotive glass plant in China. The \$55 million plant will produce laminated and tempered glass; production was scheduled to start in the first quarter of 2008. Capacity at

The Chinese Ceramic Society



Founded in 1945, CCerS is an academic, not-for-profit organization for professionals engaged in the science and technology of inorganic and non-metallic materials in China. It temporarily changed its name to the "Chinese Silicate Society" in 1956, but reassumed its original name in 1991.

The Society has several formal tasks and goals. They include

- conducting technical and academic exchange,
- editing and publishing professional books and periodicals,
- conducting continuing education and scientific popularization,
- providing decision-making and consulting services,
- safeguarding the legitimate rights

of the professionals and reward those who excel in their work, and

- conducting international academic exchanges in terms of conferences, exhibitions and personal exchange.

CCerS employs a National Congress, the supreme governing body of the CCS, which convenes every five years. A Board of Directors is elected at the congress and is empowered to implement the resolutions and exercise leadership between congress meetings. There are also standing committees of the CCerS Board that assist with regional branch affairs and 18 professional subcommittees. In addition, there are working committees on academics, technical consulting and promoting and popularizing the scientific aspects of ceramics.

CCerS maintains a headquarters in Beijing with a staff that assists in the Society's administration, membership services, international relations

and consultation services. The headquarters also staffs a department for its publications, which include the monthly *Journal of the Chinese Ceramic Society* and the bimonthly *Bulletin of the Chinese Ceramic Society*.

Currently, CCerS' membership includes 19,000 individuals and 49 group members in 19 subdivisions, such as glass, ceramic, cement and refractories.

CCerS is designed to rally the efforts of the professionals, promote science and technology, raise science awareness among grassroots, cultivate talents and adapt science and technology to economic development.

A big part of CCerS activities are the organization, sponsorship and promotion of domestic and international meetings. The Society, for example, has been involved in the organization of the International Symposium on Cement and Concrete,

the new plant is expected to reach 1 million car sets per year.

Fiberglass is another potent market. In 2007, China's total output of fiberglass was 1.6 million tons, an increase of 38 percent year-on-year, and accounting for 37 percent of the global output of fiberglass. The export volume of its fiberglass was 1.085 million tons, an increase of 37 percent year-on-year, and accounting for 29 percent of the world's total fiberglass output. China's capacity has surpassed the U.S.'s and is now the world's largest fiberglass producer.

China's energy efficiency efforts are also being felt in the glass industry. Although many glass producers have introduced low-E glass production lines, there is a huge gap between capacity and demand. China's demand for low-E glass by 2010 will amount to 97 million square meters but the national output will reach only 50 million square meters.

Advanced-glass opportunities are also on the rise in China. Corning Inc. recently hosted a grand-opening ceremony for the company's new liquid crystal display glass substrate manufac-

turing facility. The plant, located in the Beijing Economic Technological Development Area, is the company's first thin-film transistor-LCD glass production facility in China.

Renewable energy

While there is too little space here to do it full justice, ceramics and energy are already finding a great marriage in China.

Already, China is one of the world's largest consumers of solar-based energy systems. Rooftops across the nation have low-priced solar water panels that provide residential hot water. The production of photovoltaic products and fuel cells is also on the upswing and are driving research in thin layers, catalysts and nanotechnologies.

China has chosen wind power as an important alternative source. In order to encourage technical innovation, market expansion and commercialization, development targets have been established for 2010 and 2020, concession projects offered and policies introduced to encourage domestic production.

By the end of 2006, cumulative installed wind capacity had reached 2.6

GW; the average annual growth rate over the past 10 years has been 46 percent. Between 2004 and 2006, China's ranking in the world wind energy league moved up from the top 10 to the top 6, and the country is planning to host some of the biggest wind farms in the world. At the present growth rate, the 2010 target will be reached two years early.

The 'headquartered economy'

Numbers aside, China is serious about making ceramics a "headquarter economy." There are three key strategic trends in the field of ceramics in China that indicate these efforts.

The first is the creation of regional "ceramic" zones or cities. Foremost among these may be the creation in the Foshan region of the "China Ceramic City." Imagine Chicago's Merchandise Mart, but on a much, much larger scale.

It makes sense to have concentrated ceramics marketing in Foshan. It has a thousand-year history with ceramics, and currently there are more than 300 ceramics enterprises located there. They range from building products to tile to whiteware.

the International Conference on High-Performance Ceramics and the China International Powder & Powder Industry Technology Exhibition.

One of C CerS' best-known events is its annual International Glass Industrial Technical Exhibition (better known as "China Glass"), which it organizes in partnership with the Shanghai and Beijing Ceramic Societies. Initiated in 1986, China Glass is a grand gathering of the glass circles in the world (even years in Beijing and odd years in Shanghai). The event has long been supported by all glass-related governmental departments and nationwide industrial associations of China, including Chinese Building Materials Federation, China National Light Industry Council, China Machinery Industry Federation, China Association for Science and Technology, China National Association for Glass Industry and Chinese Architectural and

Industrial Glass Association. Because of the growth in interest in this expo, China Glass has become one of the three largest international glass exhibitions in the world.

China Glass 2008 was held in Beijing. The event covered 53,000 square meters of expo space occupied by 738 exhibitors, including 248 foreign companies from 21 countries gathered in 10 exhibition halls. It attracted 30,391 visitors, 2,600 from 88 foreign countries.

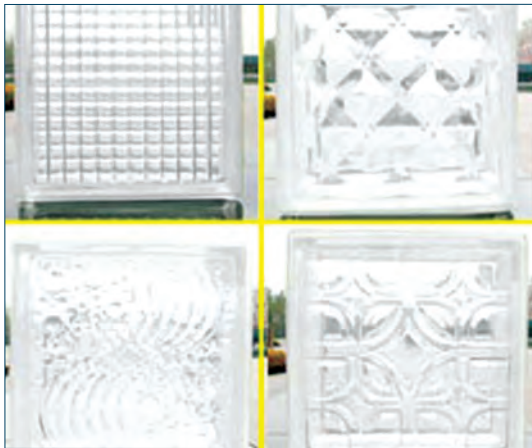
CCerS is already planning for China Glass 2009 at the Shanghai New International Expo Centre May 13-16. CCerS' goal is to eclipse this year's numbers and have 3,000 foreign attendees from more than 100 countries.

CCerS actively contributes to international academic exchange in several



Zhang Renwei, (left) president of CCerS, Jin Zhanping, secretary general, and Llu Jie, vice secretary.

international organizations such as the International Commission on Glass, the International Ceramic Federation, the Unified International Technical Conference on Refractories and the International Organization on Crystal Growth. Visit ceramsoc.com. ■



Innovative glass block designs are among the many products feature at the Foshan China Ceramic City

For example, their yearly production capacity for construction-purpose ceramics accounts for 40 percent of the nation's total, and 25 percent of worldwide capacity. 2007 marked a significant year for Foshan ceramics. The industry has stepped on a new stage by shifting their enterprises to other places, upgrading the industry, renovating products and active branding.

The Ceramic City brings these products into one central area and helps strengthen the overall brand for Foshan and the nation's ceramics. The idea was expanded in 2007: A second phase of the China Ceramics City project was approved and was positioned as a head-quarter base for the Chinese ceramics industry.

But, this is requiring some shifts in the content of the Ceramic City. Lan Weibing, director of Foshan Branch of China Ceramics Industry Association says, "To upgrade the industry, we should actively develop headquarter economy on one hand. On the other hand, we shall transform the ceramics products toward high-end, high-value [products] and low pollution."

Institutionalization

The second big ceramic trend in China is development of specialty research and training institutions, such as the Shanghai Institute of Ceramics Chinese Academy of Science.

SICCAS has become a comprehensive research organization, pioneering basic research, high-tech materials innovation and applied research. The main research covers structural ceramics and composites, inorganic functional ceramics, artificial single crystals, inorganic coatings, special glasses, biological ceramics and texture engineering material, environmental and energy source material, space material and engineering, the analysis, testing and characterization of inorganic materials as well as the science and technology study on Chinese Ancient Ceramics.

SICCAS staff edit the *Journal of Inorganic Materials of the Chinese Central Academic Periodicals*.

One of the most remarkable things about SICCAS is the institutions focus on developing the next generation of ceramic scientists, engineers and entrepreneurs. SICCAS has been authorized to grant Ph.D. and masters degrees and has set up a circulating postdoctorate station. Currently, there are more than 300 research students working for their diplomas.

In recent years, SICCAS has accomplished 601 research achievements and won 316 scientific and technical awards from the Chinese Academy of Sciences as well as ministries or provinces. Among them, 24 achievements was the National Invention Prize, five National Natural Science prizes and 13 National Science and Technology Advanced prizes. Meanwhile, the Institute fostered and education a large number of qualified and talented researchers accelerating the development of China's knowledge of inorganic materials.

SICCAS has also created a company for marketing and developing its research: the Shanghai SICCAS High Technology Corporation.

The institute also hosts many international exchanges, lectures and informal gatherings and has hosted ACerS leaders on several occasions.

A materials world

The third major trend has to do with materials acquisition. As noted in the August issue of the *Bulletin*, China has very strong and strategic interests in maintaining access to raw material such as bauxite. To stabilize its economy, the nation has spent decades ensuring it has continued access to all vital materials.

"First and foremost, China's energy needs require oil and gas for the foreseeable future," says Stephen Hill, academic director of OSU's Center for International Business Education and Research. "For example, China has made extensive agreements with Kenya and Nigeria, establishing long-term contracts for those countries' oil reserves."

In regard to ceramics, China has been signing long-term contracts for key ingredients such as bauxite, abrasives, and boron. This strategy provides a degree of security for China's internal consumption and also allows it to have never-before leverage in the international markets.

For example, China currently provides the U.S. with 77 percent of crude fused aluminum carbide and 35 percent of silicon carbide grain. It provides much of the worldwide demand for feldspar, graphite, talc, indium, lithium and rare earths.

While China still combines both the starkly old and the stunningly new, it deserves to be followed closely, not out of fear or avoidance of competition, but because it simply is, and will continue to be, just as it has for thousand of years.

ACerS was one of the first groups to explore and study China after relations between it and the U.S. thawed in the 1970s and early 1980s. The Society is committed to presenting an objective appraisal of China because there is so much to share and learn from each other. And, it is certain that ACerS, and virtually every other international ceramics group will continue to maintain fraternal and fruitful ties with our Chinese counterparts (see "About the Chinese Ceramic Society"). ■

Offshoring heyday over?

Depending on one's role in the production chain, the shift in ceramic production, particularly whitewares and sanitary wares, has either been a blessing or a curse. Some businesses were clobbered by Chinese companies. Other domestic producers jumped on the can't-beat-em-so-we'll-join-em bandwagon, and built joint ventures or signed sourcing agreements with Chinese outfits.

Thus, the steady movement of the production of ceramic goods to China has been a given. The mantra for this movement has been: lower labor costs, a stable global economy and rapidly growing markets within China.

Or, is this really such a "given"? Many experts are sensing a change. According to an eye-opening recent article in the September issue of the *McKinsey Quarterly* by Ajay Goel, Nazgol Moussavi and Vats N. Srivatsan, during the past two years, "the favorable economic winds that carried offshoring forward have turned turbulent. The new conditions are undermining some of the factors that made manufacturers of every stripe, including those in high tech, move production offshore."

The authors say the factors that favored offshoring in China are actually "moving toward a tipping point," and predict that China may lose much of its edge.

What's this all about? Energy costs and oil price rises for starters. Crude oil prices have tripled since the beginning of the century. Since 2003, crude oil has soared from \$28 to more than \$100 a barrel. The authors say the embedded costs of energy in shipping have jumped from three percent to 11 percent. On a practical level, they say, the cost of shipping a standard 40-foot container has tripled since 2000.

Similarly, the costs for energy within China and increasing environmental regulations are a huge factor. Facilities that could burn cheap low-quality coal are being curtailed or eliminated, and volume users of electricity are facing higher charges and even orders to close operations

Jumps in the price of raw materials are also huge factors. Over half of the cost of iron brought from Brazil to Chinese steelmakers is because of shipping – more than the material cost, itself.

Pressure to increase wages and standards of living is becoming enormous. "China has averaged 19 percent since 2003. An average production worker, paid \$1,740 a year in 2003, makes \$4,140 today. By contrast, wage inflation in the United States has averaged only three percent," say Goel, Moussavi and Srivatsan.

Labor costs in neighboring Mexico are rapidly approaching China's. "In 2003, Mexican workers made more than twice what their Chinese counterparts did; today that gap has narrowed to 1.15 times.

China's linkage of its currency to the dollar is also problematic. Because of the drop in the dollar's value overseas, the yuan also purchases less and less.

Sourcing from China already had some downsides: requirements for long lead times, threats to intellectual property, public relations and quality concerns. Old concerns plus these new trends are forcing manufacturers and distributors in the United States and North America to recalculate the equations behind their make-assemble-buy decisions. China is no longer automatically the optimal location, and, for the first time in decades, there may be a real possibility to re-establish whiteware and sanitaryware manufacturing and assembly in or near the U.S. ■

