Progress of Geopolymer Industrialization in China

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Main Points of the Presentation

- 1. Introduction;
- 2. Basic present situation;
- 3. Future Expectations

1.Introduction

- For a long time, the concept of geopolymers in the industry has been rather ambiguous, and most people have found it difficult to clearly distinguish geopolymers from alkali-activated materials.
- This situation began to change in 2020, with the publication of the fifth edition of "Geopolymer Chemistry & Applications" by Professor Joseph Davidovits and the wide dissemination of his video reports on the theme of "Geopolymers are not alkali-activated materials".
- As a result, we have gained a deeper understanding of the nature of this material.

- Based on this, the association promptly organized industry experts and scholars to systematically carry out the translation, promotion, training and promotion of Professor Davidovits's monographs and reports.
- Since then, we have advanced a series of crucial and systematic work:

- In 2021, the Geopolymer & Green Building Materials Work Committee of CBCA was established;
- In 2023, the industry experts were for the first time invited to participate in the 15th Geopolymer Camp International Conference，which were held here, the year before last year;
- From 2023 to 2024, China's first standard for low-carbon cementitious materials,the fly ash based geopolymer was formulated;
- In 2024,three consecutive national-level training courses on geopolymers and green building materials were held to popularize geopolymers knowledge and cultivate professional talents.

- During the training process, the outstanding trainees sent by Zhejiang Bopu Company caught our attention.
- Mr. Jiang Huaping, the chairman of the company, attaches great importance to this and immediately initiated the preparatory work for the construction of the Bopu’s One million-ton geopolymer cement and products factory.
- We plan to build this factory into China's first industrialization demonstration base for geopolymers that strictly follows the theoretical system of Professor Davidovits.

- For the 17th Geopolymer Camp, International Conference,which is taking place now in Saint-Quentin, north of Paris, France this time, we organized the Chinese delegation to attend collectively. As a demonstration project, Mr. Jiang Huaping, the chairman of Zhejiang Bopu, also led a team to attend in person.
- This fully demonstrates our determination to address global climate change, firmly follow the path of green development, and vigorously promote the implementation and industrialization of geopolymers and green building materials in China.

2. Basic present situation

- At present, there are 2 to 3 industrialized factories of geopolymer in China, but almost none of them can operate normally and continuously.
- The following is the specific situation:

- The first one, the Dalian Hengxiang Fly Ash Comprehensive Utilization Co., Ltd. is a pioneer in the industry, supported by the technical team of Professor Zhai Guanjie.
- It focuses on the production of geopolymer concrete products in fly ash bases, with its core product being artificial fish reefs for sea cucumber farming. The company has a development history of over ten years.
- The early production of the enterprise was intermittent. In recent years, it has gradually entered a stable development period. It is expected that the output will reach 100 million artificial fish reefs by 2025.
- Its technological research and development strength has been recognized, and it has been approved as the Key Laboratory of Geopolymer Materials of Dalian City.

- The second one, Shanghai Baiaoheng New Materials Co., LTD. : It is supported by the technical team of Professor Wang Dongmin from China University of Mining and Technology (Beijing).
- Among the more influential factories that receive technical support from it is the geopolymer low-carbon cementitious materials factory in Jiaozuo, Henan Province. Using industrial solid wastes such as slag and fly ash as raw materials, through the grinding/homogenization process with composite alkali-based activators, a low-carbon silicaluminous cementitious material with high strength, low shrinkage and good corrosion resistance is produced. It has been in production for two years now, but it is said that it has not been operating at full capacity and has also encountered problems such as market promotion.

The team is currently formulating national standards and conducting mechanical and workability tests based on the Portland cement standards.

This company is also expanding its business in Jiangsu and other places, including handling silt from the seaside for road infrastructure construction.

In addition, several companies are preparing to build factories, but due to various reasons, they have not yet broken ground and have only developed some laboratory products so far.

- The third company, Baotou Bopu Geopolymer Cement & Products Factory:
- This is a factory that we are focusing on supporting and building. Under the guidance of Professor Davidovits and with the assistance of Professor Li Hui's team, it is designed to produce one million tons of geopolymer cement or low-carbon cementitious materials annually.
- The factory is currently under construction and is expected to be put into operation by the end of this year.

- This time, we are leading the Chinese geopolymers delegation to attend the 17th Geopolymer Camp International Conference.
- On the one hand, we are presenting a series of works we have done in the industrialization of geopolymers in China, especially the first demonstration factory which would be built entirely under the theoretical guidance of Professor Davidovits, as a best tribute to Professor Joseph Davidovits on his 90th birthday.
- On the other hand, we also hope to take this opportunity to learn from our counterparts from all over the world, pool everyone's wisdom and do our work even better.

3. Future expectations

- In 2026, we strive to build China's first geopolymer cement and products factory in Baotou, which is fully guided by Professor Davidovits’s theory.
- Subsequently, it will be gradually promoted to 30 provinces in China, ensuring that there is at least one geopolymer demonstration factory in each province.

- In 2024, China's cement output was approximately 1.825 billion tons, accounting for 52.70% of the world's cement production (at its peak, this proportion was close to 60%).
- China has committed to achieving national carbon peak by 2030 and national carbon neutrality by 2060.
- Due to the decline in demand and technological progress, the cement industry reached its production peak in 2014 (2.48 billion tons), its carbon emission peak in 2020 (mainly due to the decline in demand), and its carbon emissions began to decline already in 2021.

- Nevertheless, China's cement production capacity remains severely overcapacity (operating rate is approximately 50%). In the coming decades, capacity reduction and achieving carbon neutrality will be one of the main tasks of the cement industry.
- It is delightful to note that in 2024, the UK launched its largest geopolymer cement plant (with an annual production capacity of 120,000 tons), and its carbon emissions have been reduced by up to 85% compared to Portland cement.

- In China, the cement industry will face significant pressure for carbon reduction in the coming decades. We will fully leverage the huge carbon reduction potential of geopolymer cement to drive the industry to shift from quantitative growth to high-quality, green and sustainable growth.
- China generates over 10 billion tons (approximately 5 billion tons of inorganic waste and 5 billion tons of organic waste) of industrial and agricultural waste each year, all of which will become high-quality raw materials for developing geopolymer cement and concrete.

- We firmly believe that through exchanges and learning with our counterparts from all over the world, we will definitely be able to achieve the "3060" carbon neutrality goal, and enable geopolymer green building materials to take root, blossom and bear fruit in China.

- (Note: This is the speech report prepared by Professor Cui Yuansheng, the president of the China Bulk Cement Association of Promotion & Development , for the 17th International Conference on Geopolymer Camp to be held in Saint-Quentin, northern Paris, France, from July 7th to 9th, 2025)

- Thank you very much
- for your attention !