aramco

CNBM | CBMA

NEXCEL

Nonmetallic Excellence and Innovation Center for Building Materials

非金属材料创新中心

1 INTRODUCTION

WIN-WIN COOPERATION

ABOUT NEXCEL

Non-metallic Excellence and Innovation Center for Building Materials (NEXCEL) is jointly established by Saudi Aramco, the world's largest producer of energy and chemical products, together with China National Building Material Group (CNBM), the world's largest building materials manufacturer and services provider, and China Building Materials Academy (CBMA), the largest comprehensive research institution for building materials in China. Saudi Aramco as the founding sponsor of NEXCEL and CBMA as NEXCEL' s operator are working together to accelerate non-metallic technology deployment in the building and construction sector, and deploy innovative non-metallic technologies to provide more sustainable construction solutions.

VISION

Transform the building and construction sector to non-metallic based materials to improve sustainability, asset life cycle and lower carbon footprint.

MISSION

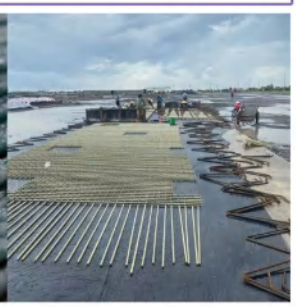
Expand and accelerate non-metallic technology deployment in the building and construction sector by developing and advocating non-metallic products, establishing and transforming non-metallic material standards and regulations, fostering effective non-metallic material awareness and training for the building and construction community.

6 FOCUS AREAS

4 CORE FUNCTIONS

2 PROJECTS

Projects on FRPs & Advanced Composite	
1	Comprehensive promotion and improvement of FRP reinforced composite materials and engineering structural members
2	Development and demonstration of composite lattice tower for communication and power transmission over 15m
3	High–modulus Elinvar glass fiber reinforce resin matrix composite engineering components
4	Preparation and application of FRP bent bar under corrosive environment
5	Fire endurance and creep resistance improvement for application of GFRP rebars
6	Standardization of product properties for continuous fiber reinforced thermoplastic resin composite rebars
7	CFRP prestressed concrete assembled raft-type floating structures
8	Research on fatigue-creep coupling behavior of glass-fiber reinforced resin matrix composites
9	Fiber reinforced concrete and its surface strengthening for novel transportation infrastructure
10	Application and demonstration of FRP tube-concrete novel composite structure
11	Research and demonstration on thermoplastic FRP stirrup
12	Synthesis of phosphorus-containing metalimidazole complex flame-retardant latent curing agents and their effect on the curing, flame retardancy and smoke suppression properties of epoxy resin
13	Study on multi-functional carbon fabric reinforced seawater and sea sand concrete composite component system
14	Ultimate and serviceability limit state design for FRP-UHPC hybrid beams



Projects on Pavement for Roads & Bridges	
1	Mechanical foaming warm mix asphalt characteristics and mixture performance improvement and engineering demonstration
2	Application technology and engineering demonstration of hot in-place recycling of waste asphalt pavement
3	Multi-scale study on interface adhesion and failure mechanism between asphalt and aggregate
4	Effects of recycled plastics on the performance of asphalt mixture
5	Development and demonstration of non-metallic additives for emission absorption and permanent sequestration of CO_2 in asphalt pavement
6	Development and demonstration of high-performance polymer mixture pavement with higher durability and longer service life
7	Research and demonstration on snow melting of phase change energy storage asphalt mixture
8	Application and demonstration of hydrocarbon-based graphene in asphalt mixture
9	Preventive maintenance material design and multiscale characterization of its working mechanism for porous asphalt pavement
10	Aging mechanism and phase structure in heterogeneous system of SBS modified asphalt

2 PROJECTS

Projects on Construction Chemicals

1	Research and application of novel polyether macromonomer and ultra-highly dispersing polycarboxylate superplasticizer
2	Research and demonstration application of admixtures for (ready-mixed fluid) solidified soil
3	Preparation and properties of petroleum coke porous carbon/paraffin composite phase change materials
4	Standardization and demonstration of preparing building formwork with waste plastics
5	Development of self-healing fire-retardant coatings highly compatible with non-metallic surfaces

Projects on Insulation & Composite Cladding

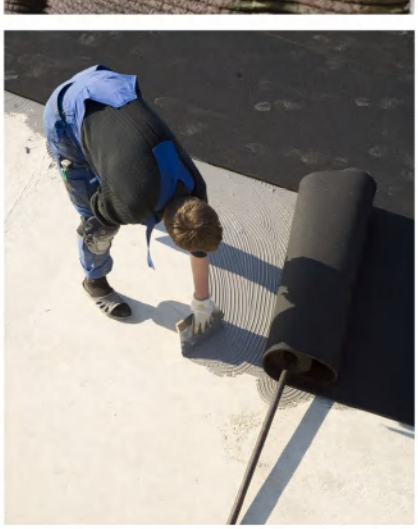
1	Investigation on recycled polystyrene particles/foamed concrete composite insulation material and its application in composite sandwich panel
2	Research and demonstration on thermal insulation and structure integration technology for ultra-low energy buildings
3	Development and demonstration of polymer aerogel composites
4	Develop certification for external thermal insulation composite systems (ETICS)
5	Surface modification of extruded polystyrene foam and the study of its flame retardancy and adhesion performances

Projects on Special Mortars & Concrete

1	Research on 3D printed polymer modified concrete and its interface enhancement technology
2	Study on key technology of polymer modified inferior coarse aggregate
3	Develop hydrocarbon-based graphene for improving properties of concrete
4	Research on gradient enhanced polymer modified concrete for structural use and comparison with conventional concrete
5	Beneficial use of DPCR to prepare CO_2-ready-mix cement-based materials
6	Study on the performance regulation mechanism of cement-based materials based on in-situ polymerization
7	Preparation of railway sleeper using engineered cementitious composite (ECC) and research on its static and dynamic mechanical properties
8	Preparation and mechanism of carbon black/cementbased electromagnetic wave absorbing materials with multi-mechanism

Projects on Waterproofing & Repair Materials

1	Development and engineering demonstration for thermoplastic polyolefin waterproofing sheets with high flame retardancy and long service life
2	Preparation and performance of self-healing polymer modified asphalt waterproofing membrane



3 PRODUCTS


FRP composite lattice tower

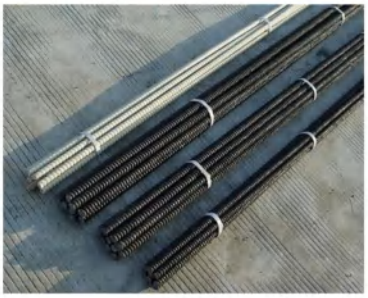
FRP composite lattice tower is composed of glass fiber reinforced polyurethane resin composites. Its dielectric corrosion resistance and weather resistance is much higher than traditional metal materials. It is light weight, high strength, easy to transport and install, and can replace the traditional metal tower, used in communication, power and other fields.

Ultra-high dispersion polycarboxylic superplasticizer

Ultra-high dispersion polycarboxylate superplasticizer improves its compatibility and dispersibility to cement by introducing a new functional polyether monomer, and ensures a smooth and orderly reaction by automating the synthesis process to avoid reduction of synthesis efficiency caused by production fluctuations.

Admixture for ready-mixed fluid solidified soil

Admixture for ready-mixed fluid solidified soil can achieve flow state, self-compacting, adjustable strength, non-structural backfilling of fluid soil, and structural application, which can use local soil, silt, construction waste, bulk solid waste, tailings and other resources, reduce dependence on natural materials, reduce costs and environmental damage.



Fiber reinforced thermoplastic resin composite reinforcement

Fiber reinforced thermoplastic resin composite reinforcement has the advantages of repeatable molding, high toughness, high durability and recyclability. It can replace steel or fiber reinforced thermosetting resin composite reinforcement. It is an important solution to cope with complex service environment and solve maintenance problems, and will improve the service performance and life of structure.

High performance fiber reinforced composite pultruded profile

High performance fiber reinforced composite pultruded profiles are composites made of fiber and resin matrix by pultrusion process. Compared with traditional building materials (such as steel and concrete), pultruded profiles have the advantages of light weight, high strength, corrosion resistance and low carbon.

Recycled plastic building formwork

Recycled plastic building formwork is the ideal product for recycling waste plastics, it is mainly used for concrete molding, with light weight, wear-resistant, smooth surface, easy to demold, recyclable, low cost, can effectively help reduce "white pollution", carbon emissions, and the usage of wood, steel and other resources.

Recycled expanded polystyrene particles/foam concrete composite sandwich wall panel

The composite sandwich wall panel using recycled expanded polystyrene (EPS) particles/foam concrete as the core material has a more uniform distribution of EPS, the surface temperature distribution of this panel is basically the same, and the heat transfer coefficient is lower, showing more excellent thermal insulation performance.

Novel self-healing fire retardant coating

By incorporating micro capsules with self-healing properties and a layered double hydroxide and graphene composite with flame-retardant properties into traditional polymer coatings such as epoxy, polyurethane, and alkyd resin, a self-healing and fire-retardant integrated coating with excellent self-healing performance and flame-retardant function can be prepared.

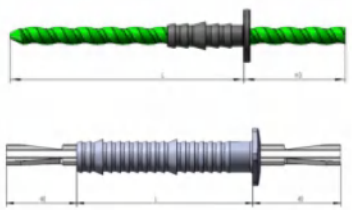
Thermoplastic polyolefin (TPO) waterproofing membrane

Compared with ordinary single-layer roof waterproofing membrane, thermoplastic polyolefin (TPO) waterproofing membrane has advantages in flame retardancy and durability, and is the best choice for long-term high-temperature conditions such as photovoltaic roofs. The flame retardant performance can reach B2 or above.

Polyisocyanurate (PIR) insulation material

PIR (Polyisocyanurate) insulation material is a high-performance insulation material formed through chemical structural modification and process optimization. It achieves significant improvements in flame retardancy and insulation performance compared to traditional polyurethane.

3 PRODUCTS



GFRP connectors

GFRP connectors are key components used in building envelopes such as prefabricated concrete sandwich insulation walls. Their primary function is to efficiently connect the inner and outer concrete wall panels while securing the intermediate insulation material, significantly reducing the thermal bridge effect.

GFRP stirrups

By improving winding, pulling, and coiling equipment, and focusing on cost control, the process parameters of the combined closed stirrup and spiral stirrup production lines are optimized. GFRP stirrup molds are also refined, enhancing the production efficiency and mechanical performance of the stirrups

Phase change energy storage particles

Phase change energy storage particles combine the physical strength of polymers while retaining the original thermophysical properties of the phase change energy storage material to the greatest extent, addressing the leakage issue of the material in its liquid state.

Phase change energy storage asphalt mixture

Phase change energy storage asphalt mixture is a functional pavement material that stores/releases heat at a constant temperature through latent heat of phase change. The heat stored by latent heat of phase change is equivalent to tens or hundreds of times the sensible heat storage of materials.

Hydrocarbon-based graphene for concrete

The core function of the "hydrocarbon-based graphene" product is to serve as a high-performance nano-filler, significantly enhancing the mechanical properties, durability, and multi-functionality (such as electrical conductivity) of cement concrete.

THCHNOLOGIES

Mechanical foaming warm mixed asphalt

Through mechanical foaming process and warm mixing agent, the construction temperature of asphalt mixture can be reduced from 170-180℃ to 140-150℃, thus reducing the energy consumption and the emission of asphalt smoke and carbon dioxide.

On-site recycling of waste asphalt pavement

By using a new additive with dual functions of regeneration and warm mixing, the original pavement material can be used 100% on site, the construction temperature can be reduced by 30℃, the harmful gas emissions can be reduced, and the road performance of recycled asphalt mixture can be improved.

Recycled plastic asphalt mixture

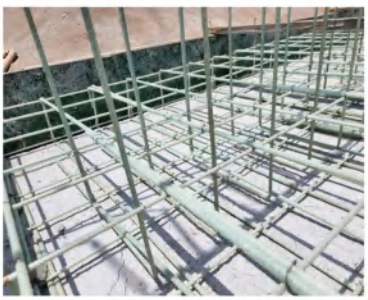
Recycled thermoplastics can replace 20% of asphalt in asphalt mixture, and thermosetting plastics can replace 80% of traditional mineral powder. At the same time, a variety of supporting equipment and related construction processes have been developed.

3D printing technology for construction

The complete set of 3D printing technology includes materials, robot system and on-site construction technology in desert. The core patent of technology won the Silver Award of the 48th Geneva International Invention Exhibition, and the results were recognized by the international community.

Polymer modified inferior coarse aggregate

Polymer modified inferior coarse aggregate can improve the surface structure, reduce the water absorption, and improve the strength of polymer modified inferior coarse aggregate concrete according to different characteristics of inferior coarse aggregate, so as to solve the problem of inferior coarse aggregate.



Performance enhancement technology for GFRP rebar

This technology demonstrates advantages in both fire resistance and creep resistance, maintaining reliable mechanical properties in high-temperature and long-term service environments, and providing support for the safe and durable use of composite reinforcement in civil engineering structures.

4 APPLICATION

Building & Construction

TPO Waterproofing Membrane in Western Science City

PIR Insulation Material Applied to Ultra-low Energy Buildings

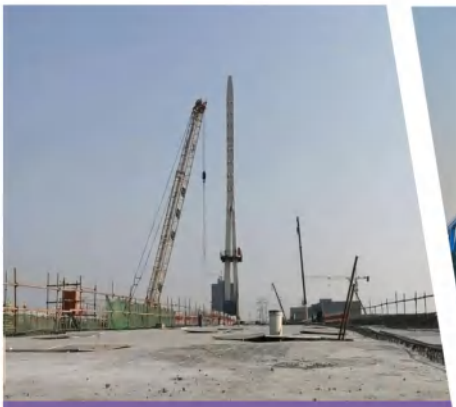
Waste Plastics Applied to Building Formwork

Recycled EPS/foamed Concrete in Composite Sandwich Panel Applied to Fabricated Buildings

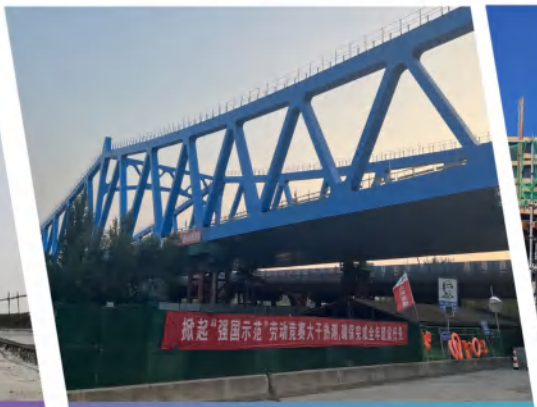
Pultruded GFRP External Frame Beam for High-rise Building

FRP Pipe-concrete Composite Structure Applied to Park Project

Bridges & Underground



Ultra-highly Dispersing PCE for UHPC Applied to Moshuihe Bridge



Ultra-highly Dispersing PCE for UHPC Applied to Xiaoqinghe Grand Bridge

Ultra-highly Dispersing PCE Applied to the Underground Pipelines

Pavement

Asphalt Mixtures Incorporating Large-contents of Recycled Plastics in Road Reconstruction

Foam Warm Mix Asphalt Technology Applied in Expressway

In-place Recycling of Waste Asphalt Pavement in Expressway

Phase Change Material Applied in Highway Construction

The Polyurethane Pavement Applied in the Urban Road

Telecom & Railways

FRP Composite Lattice Tower Built in China & Egypt

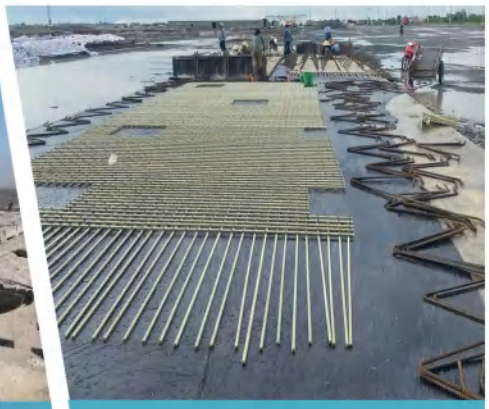
Polymer Modified Inferior Coarse Aggregate Applied to Concrete Sleepers

4 APPLICATION

Coastal Construction

Thermoplastic FRP Rebars Applied to Fuzhou Port

GFRP Rebars-concrete fence Applied to Sea Dam Renovation



FRP Rebars Applied to Dinh An Port in Vietnam

Thermoplastic Composite Bar Reinforced Concrete Prefabricated Longitudinal Beams in Offshore Base Project

Coastal Retaining Wall Project in the Waterfront Area of Barka in Oman

NEXCEL Impact

1,000t Wastes Recycled

10,000t CO_2 Reduced

≈1 million Trees Planted

STRATEGIC PARTNERS

RILEM

XÂY DỰNG ĐẠI HỌC

CCPA 中国混凝土与水泥制品协会 China Concrete & Cement-based Products Association

交通运输部公路科学研究院 RESEARCH INSTITUTE OF HIGHWAY MINISTRY OF TRANSPORT

CIEEMA 中国绝热节能材料协会 China Insulation & Energy Efficiency Materials Association

中国复合材料学会 CHINESE SOCIETY FOR COMPOSITE MATERIALS

China National Building Waterproof Association

PROJECT PARTNERS

UNIVERSITY

清華大學 Tsinghua University

哈爾濱工業大學 HARBIN INSTITUTE OF TECHNOLOGY

北京工業大學 BEIJING UNIVERSITY OF TECHNOLOGY

中南大學 CENTRAL SOUTH UNIVERSITY

武漢理工大學 WUHAN UNIVERSITY OF TECHNOLOGY

上海交通大學 SHANGHAI JIAO TONG UNIVERSITY

同濟大學 TONGJI UNIVERSITY

西安交通大學 XI'AN JIAOTONG UNIVERSITY

中國地質大學 CHINA UNIVERSITY OF GEOSCIENCES

華南理工大學 South China University of Technology

浙江大學 ZHEJIANG UNIVERSITY

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THE HONG KONG POLYTECHNIC UNIVERSITY 香港理工大學

南京工業大學 NANJING TECH UNIVERSITY

湖南大學 HUNAN UNIVERSITY

山東大學 SHANDONG UNIVERSITY

北京交通大學 BEIJING JIAOTONG UNIVERSITY

中山大學 SUN YAT-SEN UNIVERSITY

中國礦業大學(北京) CHINA UNIVERSITY OF MINING AND TECHNOLOGY-BEIJING

北京化工大學 BEIJING UNIVERSITY OF CHEMICAL TECHNOLOGY

河北工業大學

CityU 香港城市大學 City University of Hong Kong

合肥工業大學 HEFEI UNIVERSITY OF TECHNOLOGY

Université de Lille

INDUSTRY

国检集团

交通运输部公路科学研究院 RESEARCH INSTITUTE OF HIGHWAY MINISTRY OF TRANSPORT

SPARE

安珈新材料 AEGA ADVANCED MATERIALS

哈尔滨玻璃钢研究院有限公司 Harbin FRP Institute Co.,Ltd.

中复碳芯电缆科技有限公司 ZHONGFU CARBON CORE CABLE TECHNOLOGY CO., LTD

江苏宿迁交通工程建设有限公司 Jiangsu Suqian Traffic Engineering construction Co. LTD

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中国建科

中国建筑标准设计研究院有限公司 CHINA INSTITUTE OF BUILDING STANDARD DESIGN & RESEARCH

NELD 耐尔得

江苏恒美德新材料有限公司 Jiangsu Chemlead New Material Co., Ltd.

中国建筑第八工程局有限公司 CHINA CONSTRUCTION EIGHTH ENGINEERING DIVISION CORP., LTD

泰山玻璃纤维有限公司 Taishan Fiberglass Inc.

中国建筑防水协会 AAAAA级社会组织 全国先进社会组织

中国建筑材料联合会 China Building Materials Federation

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贵州省公路工程集团有限公司 GUIZHOU HIGHWAY ENGINEERING GROUP CO., LTD

中国复合材料学会 CHINESE SOCIETY FOR COMPOSITE MATERIALS

Contact Us

504/505-State Key Laboratory of Green Building Materials
No.1 Guanzhuangdongli, Chaoyang District, Beijing, China
Email: nexcel@cbma.com.cn
http://www.non-metallic.net/