泡沫玻璃
Cellular Glass

泡沫玻璃是一种以玻璃为主要原料，掺入适量发泡剂，通过高温隧道窑炉发泡，后经退火冷却加工处理后制得，具有均匀的独立密闭气孔结构的新型无机绝热材料。由于它完全保留了无机玻璃的化学稳定性，具有低密度、导热系数小、不透湿、不吸水、不燃烧、不霉变、不受鼠啮、机械强度高却又易加工，及能耐除氢氟酸以外所有的化学侵蚀的特性。

Cellular glass is a kind of inorganic thermal insulating material with a structure of equally closed cells. It is mainly made of glass, added with adequate foaming agents, foamed in high-temperature tunnel furnace and then annealed in cooling furnace. It well reserves the chemical stability of inorganic glass. As a result, it has the following features: low density, low thermal conductivity, vapor impermeability, no water absorption, incombustibility, protection from mould and rat eating, high mechanical strength but easy to cut and able to bear all kinds of chemical erosions except the hydrofluoric acid.

泡沫玻璃不但本身无毒，化学性能稳定，以及能在超低温到高温的广泛温度范围内不会变质的良好隔热性能，而且本身又起到防潮、防火、防腐的作用。它在低温深冷、地下、露天、易燃、易潮以及化学侵蚀等苛刻环境下使用时，不但安全可靠，而且经久耐用，被誉为“不需更换的永久隔热材料”。所以被广泛应用于石油、化工、建筑、冷库、地下工程、造船、国防军工等永久性工程的隔热保冷。

Cellular glass, nontoxic in itself, has stable chemical properties and good thermal insulating performance protecting from deteriorating at a wide temperature range from cryogenic temperature to high temperature. At the same time, it can protect from humidity, fire and erosion. It is praised as “permanent thermal insulating material with no need of renewal”, because it is not only safe but also durable in rigor conditions of low and cryogenic temperature, underground, open air, flammability, moisture sensitivity and even chemical erosion. Consequently, it is widely applied in permanent projects as heat and cold insulating material, such as in the industries of petroleum, chemical engineering, architecture, refrigerated warehouse, underground project, shipbuilding, national defense and war industry.

目前，国内的泡沫玻璃生产厂家普遍都是以回收废玻璃为生产原料，无法根据实际情况调整玻璃原料的成分。由于受废玻璃原有特性的局限，及加工工艺及设备等多种因素的限制，产品在导热系数和抗压强度等技术性能上与国外同类产品存在明显的差距。

Currently, domestic manufacturers use recycled wasted glass to produce cellular glass. As a result, they cannot adjust the glass composition as per application purpose. Due to the limitations of the properties of recycled glass, fabrication processing technology and equipment, etc, domestic manufacturers can only produce cellular glass, with the quality much worse than imported product, such as thermal conductivity and compressive strength.

为了克服传统泡沫玻璃产品的缺陷，我公司组建技术研发队伍，突破技术瓶颈，建成高性能泡沫玻璃生产线。新生产线采用玻璃熔窑，利用石英砂生产玻璃，控制玻璃原材料的成分。我公司是目前国内唯一拥有玻璃原料熔制车间的泡沫玻璃生产厂家，由研发实验中心针对不同的工业用途开发不同成分的玻璃配方、直接从石英砂开始熔制玻璃，从源头上控制泡沫玻璃的质量。此外，新生产线的球磨工艺、窑炉结构、燃烧控制、打磨系统等都得到全面提升，新的生产工艺及技术配方也都做了改良，整条生产线的温度控制、计量精度、工艺参数等都实行自动控制。制成的泡沫玻璃产品的综合性能明显高于传统产品。

To overcome the defects of traditional cellular glass product, ZES made big investments and established a R&D team, to build high performance cellular glass production lines. The line starts from melter, melting right composition glass from sand. At present, ZES is the only one who owns batch house & glass melter, where makes glass material for cellular glass manufacturing. Our research lab develops special glass composition for different application purposes, and we make glass from quartz sand, which means we can control the quality of cellular glass from the headstream. Besides, the grinding processing, oven structure, combustion controlling, and finishing system, etc, have been fully upgraded, and the production processing & technical formula have been improved as well. Automatic controlling is adopted for the overall temperature control, weighing precision, processing data, and so on. And via testing, the quality of cellular glass from this new line is obviously higher than traditional products.

该泡沫玻璃生产线为国内，乃至亚洲，规模最大、品质最优的生产线，产品质量符合美国 ASTM 标准，使国内大型石化行业、建筑行业和其它用户不出国门就可采购到与国际产品相媲美的泡沫玻璃。

This line is of the biggest size and best quality in China, also in Asia. The products meet ASTM standards. It makes possible that customers from petrochemical industry, building, or other fields can buy high quality cellular glass in China, which is equivalent to international quality.

高性能泡沫玻璃的技术指标
Technical Data for High Performance Cellular Glass

性能 Property		单位 Unit	ZES 500	ZES 800	ZES 1000	ZES 1200	ZES 1400	ZES 1600	ZES 2400	测试方法 Testing Method
平均密度 Ave. Density		kg/m3	110±8 %	120±8 %	130±8 %	140±8 %	150±10 %	160±10 %	220±15 %	ASTM C303
导热系数 Thermal Conductivity	平均值 Ave. Value	W/（m·K）（10℃）	0.038	0.043	0.044	0.046	0.047	0.048	0.056	ASTM C177,ASTM C518
	最高单测值 Highest Single Value		0.040	0.044	0.046	0.048	0.049	0.050	0.058	
抗压强度 Compressive Strength	平均值 Ave. Value	MPa	0.5	0.8	1.0	1.2	1.4	1.6	2.4	ASTM C165
	最低单测值 Lowest Single Value		0.35	0.55	0.69	0.83	0.97	1.10	1.66	
抗折强度 Flexural Strength		MPa	≥0.30	≥0.31	≥0.36	≥0.39	≥0.44	≥0.48	≥0.63	ASTM C203
水蒸气渗透系数 Water Vapor Permeability		ng/（pa.m.s）	≤0.007							ASTM E96
体积吸水率 Water Absorption by Vol.		Vol%	≤0.5							ASTM C240
火焰蔓延系数 Flame Spread Index			≤5							ASTM E84
线膨胀系数 Thermal Expansion Coefficient		1/℃	9×10-6							ASTM E228
使用温度 Service Temp.		℃	-268～+480							

注 Note：

（1）上表中列出的产品为常用等级，如对产品技术数据有特殊要求的，可双方协商。
Information above are used for general purpose, any special requirements can be discussed.

（2）跟上述检测方法等效的其它方法同样适用。
Other equivalent codes to above mentioned testing methods are applicable as well.