SULFUR CONCRETE FOR PAVING ROADS AND TUNNELS

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Mission

Our mission is to find more sustainable and efficient ways to improve Qatar's infrastructure and decrease maintenance costs over time. Additionally, we seek to create innovative solutions for excess sulfur.

What is Sulfur Concrete?

Sulfur concrete is a mixture of sulfur, gravel or sand, cement and water. The mixture is melted, and then shaped and set to harden. The use of sulfur alters the mechanical properties of traditional concrete.

Main Differences between Sulfur Concrete and Portland Concrete

Sulfur Concrete :

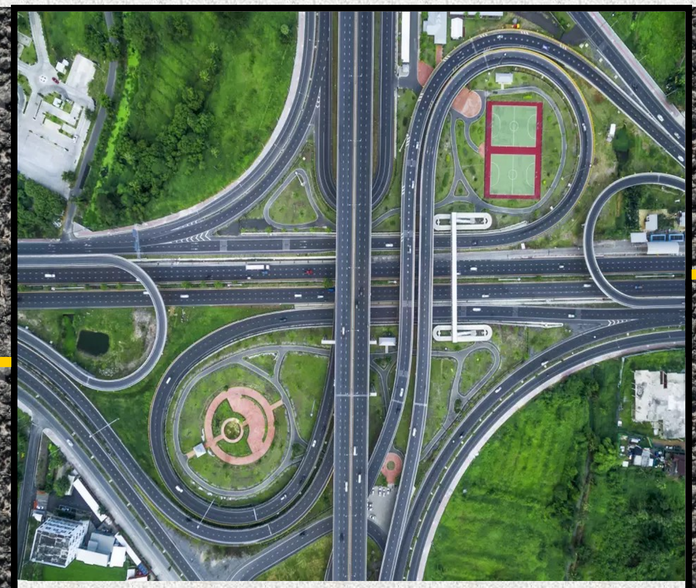
- High resistance to acid rain
- Produced with no water
- Less heat
- Lower carbon footprint
- Resists corrosion

Portland Cement :

- Low resistance to acid rain
- Produced with water
- More heat
- Higher carbon footprint
- Doesn't resist corrosion

All information taken from [1]

References:
[1] Okumura, H. A., 1975, "Sulfurcrete Sulfur Concrete Technology." COMINCO LTD.
[2] Anucha Sirivisansuwan. Jughandle (image). Available from: tripsavvy. <http://tiny.cc/engl210sc>. (November 26 2019)



Picture taken from [2]

Physical Properties of Sulfur Concrete

Compressive Strength	40-65 MPa
Tensile Strength	4-6.2 MPa
Flexural Strength	8.4-11.2 MPa
Modulus of Rupture	9.3-12.8 MPa
Modulus of Elasticity	4.14 MPa
Linear Coefficient of Expansion	8.5×10^{-6} / °C
Linear Shrinkage	0.01 %
Moisture Absorption	< 0.4 %
Density	150 lb/ft^3

All information taken from [1]

Constraints

Currently, cement costs around $150 per square meter, and sulfur concrete costs $510. Although the cost is five times more, the cost to maintain Qatar's infrastructure over time will be significantly less.

Future Development

Future plans include making sulfur concrete less expensive, eliminating the odor, and capable of withstanding a wide range of temperatures. We can achieve this by synthesizing with other materials.

Why We Chose Sulfur Concrete and Its Benefits

Sulfur is a byproduct of the petroleum extraction process, so if we use a waste product to make useful products, we will be innovative and resourceful.

We chose sulfur concrete because concrete is used for construction. As Qatar's population increases, new infrastructure will need to be built.

The benefits of sulfur concrete are that it is easily recyclable, impermeable, easy to shape, stronger than Portland cement, and hardens quickly [1].