RENCA zero-cement geopolymer 3D Printing Mortar for the first in the World 3D printed house

NEW YORK, NY, US, July 24, 2023 /EINPresswire.com/ -- RENCA's zero-cement Geopolymer 3D Printing Mortar Used in The First 3D Printed Geopolymer House in The World

Sustainability in construction is a hot topic of discussion worldwide. Building materials and construction sites are among the most significant pollution contributors. Several approaches are used to minimize the environmental impact.

Construction 3D printing is an emerging technology that conquers the building market and the minds of the people involved. Not only it allows a freedom of shape never seen before. But it also reduces the number of materials used and waste generated. Until now, the only component in construction 3D printing that significantly contributed to carbon dioxide emissions was Portland cement, which is used in all the existing mortars for 3D printing.

Genuine geopolymer materials contain 0 Portland cement, lime or gypsum and are known to be up to 90% more sustainable than ordinary cementitious analogs. They also have outstanding properties that allow the structures to withstand thousands of years instead of only a few decades.

RENCA started working on geopolymer materials in 2015. Since then, over 300 products have been designed for various applications, from waste management and encapsulation of radioactive materials to paints and shotcrete for protection from fire and aggressive substances. Plenty of by-products were used to reduce the impact of other industries in a safe way.
In 2016, Apis-Cor, a pioneer in construction 3D printing, had the first 3D printing experience with RENCA geopolymer 3D printing mortar.

Today RENCA achieved a new and significant milestone for both technologies: a complete house structure was 3D printed with RENCA geopolymer mortar. The project was conducted in the harsh conditions of the western desert of the USA, with temperatures dropping from over 110 to 50 degrees Fahrenheit (from 40 to 10°C) in just a few hours, with almost zero humidity and strong winds. Both equipment and materials (not talking about humans) had a hard time continuing to work in such an environment. But the devotion and engineering skills of the team – a collaboration between Strong Print 3D, RENCA, and Geopolymer International, made it possible.

Unlike Portland cement-based mortars and concrete, or alkali-activated materials (which are known to be user-hostile, using strong and corrosive alkalis), that both remain hydraulic binders, genuine geopolymer-based mortars and concretes, being non-hydraulic binders, give many benefits for construction 3D printing and other applications:

1. Fast setting time allows printing non-stop;
2. High strength makes it structural;
3. Chemical adhesion between the layers allows the process to stop one day and continue without any additional preparation the next day. The layers will chemically grow into each other, creating a monolith.
4. Fire-resistance (unlike ordinary cement, geopolymer withstands temperatures up to 1200°C/2200°F)
5. Corrosion resistance – geopolymers can be used for seaside structures and will not be affected by sea salt corrosion. They can also be used for sewage systems, chemical containers, and so on, where ordinary concrete is destroyed in years and even months.
6. Geopolymers are 90% more sustainable than Portland cement, emitting less CO2 into the atmosphere while manufacturing. Industrial by-products can also be used for their production, thus cleaning our planet.

Even though geopolymer mortars require a specific approach towards the mixing procedure and, unlike cementitious-based products, need to be mixed in a batch mixing system, the achieved milestone opens new horizons. The current R&D held by RENCA is to develop a one-component geopolymer mortar for continuous mixers as well as a 2K system, where you can control the setting time right at the nozzle of a 3D printer from several seconds to hours, which will add more flexibility to the system and will make it less dependent on the external conditions.

3D printing of the first geopolymer house is one of the steps taken by RENCA to promote sustainable building materials and methods to make our future cleaner and safer for everyone.

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