IIT Indore Developed Cement-Free High-Strength Concrete to Reduce CO_2 Emissions

OR

IIT Indore Builds the Future with Next-Gen Cement-Free Concrete: A Green Revolution in Sustainable Building and the Way to Net Zero

IIT Indore has taken a major step toward eco-friendly construction by developing a new type of concrete that does not use cement. This breakthrough has been achieved by Dr. Abhishek Rajput, Associate Professor and his research team from the Department of Civil Engineering at IIT Indore. Using geopolymer technology, they have created high-strength concrete that not only helps protect the environment but also performs better and lasts longer than traditional concrete.

Ordinary Portland Cement Concrete (PCC) is known to be one of the major sources of carbon dioxide emissions, contributing about 8% of global CO_2 emissions. It releases nearly 2.5 billion tonnes of CO_2 every year due to the processes involved in making cement, like burning limestone and fuel. The newly developed Geopolymer High-Strength Concrete (G-HSC) completely removes the need for cement. Instead, it uses industrial waste materials such as fly ash and ground granulated blast furnace slag (GGBS). Another benefit is that this concrete does not need water curing, which helps save water- a crucial factor in today's time of water scarcity.

This new concrete can reduce carbon dioxide emissions by up to 80% and can cut down construction costs by up to 20% when local materials are used. It is not only sustainable but also cost-effective. One of its most remarkable features is that it gains very high strength in a very short time. It achieves over 80 MPa of compressive strength in just three days. Because of this rapid strength development, it is perfect for use in urgent construction projects such as military bunkers, bridges, disaster relief structures, precast railway sleepers, and highway pavement repairs.

"This development is a step toward transforming the way we build our future infrastructure as stronger, faster and greener. The goal is to find a practical solution that benefits both the environment and the construction industry," said Dr. Abhishek Rajput, the lead researcher on the project.

Appreciating the innovation, Prof. Suhas S. Joshi, Director of IIT Indore, said, "This is an excellent example of how IIT Indore is contributing to national priorities through sustainable technology. Such developments align with India's vision for green infrastructure and carbon neutrality."

The Principal Investigator is actively seeking industry collaboration and technology transfer opportunities to take this innovation from lab to real-world application. Interested organizations may reach out to us for further discussion.

Fig.1. Cube, beam and cylinder sample of G-HSC for mechanical testing