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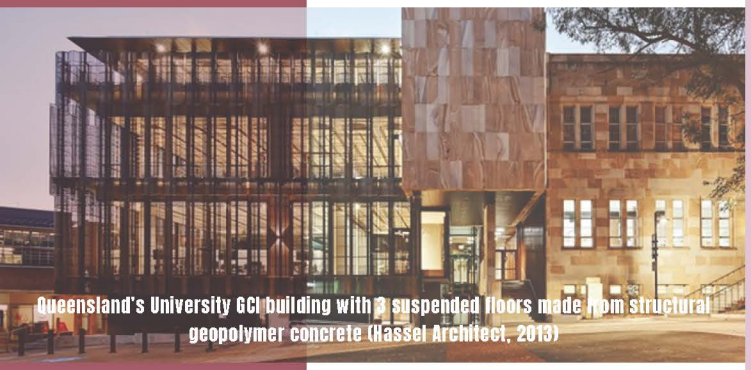
GEOPOLYMER CEMENT: THE FUTURE OF CONSTRUCTION MATERIALS



Queensland's University GCI building with 3 suspended floors made from structural geopolymer concrete (Hassel Architect, 2013)

Portland cement (PC) has an annual global production exceeding 4,000 million tonnes, a staggering 25-fold increase compared to its production in 2000. In response to this growing reliance on PC, a research team led by Ts. Dr. Warid Wazien Ahmad Zailani is pioneering the development of geopolymer cement as a sustainable alternative to traditional cement. This innovative research focuses on creating cement-free "green concrete" to reduce CO2 emissions, which currently account for approximately 5–8% of total global CO2 emissions. Of these emissions, 50–60% originate from the calcination of limestone during PC production, with the remainder from burning fossil fuels.

Geopolymer technology also addresses the issue of excessive industrial by-products such as fly ash and slag, which are often dumped in landfills across Malaysia. By combining fly ash, slag, and specific chemical precursors, a strong and highly durable binder can be produced. This binder achieves impressive strength of over 50 MPa within just one to three days, significantly faster than the 28 days required for Portland cement.

Countries like Australia and China have already embraced geopolymer materials as a large-scale alternative in the construction industry. The University of Queensland in Australia, for instance, has constructed its own building entirely with geopolymer concrete and houses several large-scale geopolymer material companies. This research exemplifies the potential of geopolymer technology as a sustainable and innovative solution for the future of construction materials, offering environmental benefits while maintaining exceptional performance.

Geopolymer has been recognized as one of the advanced materials included in the National Advanced Materials Technology Roadmap 2021–2030 by MOSTI. To establish geopolymer as an alternative binder material in Malaysia's construction industry, the geopolymer research group from the School of Civil Engineering, UiTM, has secured various research grants, including FRGS, IMAP, and international grants from Indonesia and Canada.

Additionally, this innovative product has gained recognition and accolades at both national and international innovation competitions. The successful development of green geopolymer cement is a testament to the collaboration and dedication of the entire team of researchers and students involved. This achievement underscores the potential of geopolymer technology to contribute significantly to sustainable construction practices while promoting Malaysia's advancement in construction.

Collaborative activities and MOUs at both national and international levels have been initiated to promote geopolymer research. Planned initiatives include geopolymer conferences, webinars, and workshops, as well as knowledge-sharing sessions, impactful publications, and book projects.

In conclusion, researchers must take a proactive approach to promoting their work and fostering collaborations to enhance visibility and advance their research further. These efforts will contribute to the development of research and technology and its widespread adoption in the construction industry.

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