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Influence of hydration on the mechanical, structural, thermal, and morphological properties of cement filled epoxy composites

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Abstract:
Different loading of Portland cement (PC) (10, 20, 30, and 40 wt%) was used to produce epoxy-based polymer concrete. The optimum loading was used to prepare another sample using hydration in presence of air circulation. The polymer concretes were characterized in terms of mechanical, thermal, structural and morphological properties. The properties showed increasing trends after cement addition. Results showed that the tensile strength of the polymer concretes were improved by 37.2%, 115.5%, 165.9%, and 40.6% for loading of 10, 20, 30, and 40 wt% cement, respectively. In addition, the flexural strength of the polymer concretes was also enhanced and found maximum (175.3% higher) in 30 wt% concrete compared to neat epoxy. Other mechanical properties of the polymer concrete were also found increasing. Moreover, decomposition temperature was raised nearly 15°C for adding 30 wt% cement which was the maximum among the other polymer concretes. For the case of hydration in presence of air circulation, the prepared composite showed the highest tensile mechanical performance with improved surface topography. From the results, it was concluded that the addition of cement into the epoxy was very effective to produce polymer concretes.