SOME STUDIES ON THE DEVELOPMENT AND PROPERTIES OF POLYESTER RESIN BASED POLYMER CONCRETE

by

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submitted

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CERTIFICATE

This is to certify that the thesis entitled, "SOME STUDIES ON THE DEVELOPMENT AND PROPERTIES OF POLYESTER RESIN BASED POLYMER CONCRETE", being submitted by Mr.P. Mani to the Indian Institute of Technology, Delhi, for the award of the degree of Doctor of Philosophy is a record of the bonafide research work carried out by him under our guidance and supervision.

To the best of our knowledge the thesis has reached the requisite standard. The material presented in this thesis, in part or full, has not been submitted to any other University or Institute for the award of any degree or diploma.

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ABSTRACT

This work presents a study on a polymer concrete developed which utilised a commercially available, general purpose, polyester resin and aggregates, normally used for cement concretes. The developed polyester resin concrete (PC) has shown a compressive strength of 925 Kg/cm^2, in the presence of appropriate amount of micro-filler and selective applications of coupling agent on the aggregates, from an initial value of 420 Kg/cm^2, containing no micro-filler and coupling agent. The development of PC has been carried out by optimising binder content, aggregate grading, selecting suitable coupling agent and appropriate micro-filler contents and curing conditions.

The mechanical and other properties such as compressive, tensile and flexural strengths, stress-strain characteristics, bond-shear strength, skid and abrasion resistances, chemical resistance, creep and cure-shrinkage characteristics etc., of the PC have been studied and the results have shown the superiority of PC over the conventional cement concrete for several possible applications.

The investigation of structure of PC has been carried out by several instrumental techniques. I-R, X-ray diffraction, SEM and grain size distribution analysis have shown the evidence for the possibility of chemical bonding at polymer-aggregate interface in the presence of coupling agent. Such bonding enhances load-transfer characteristics between the binder and the discrete aggregates.

The silane coupling agents MEMO and VTES have shown better bonding characteristics than the silane AMEO. This aspect has been supported by mechanical properties. Thermal analysis (TGA) has shown the improvement in thermal properties of PC in the presence of coupling agent and also shown the lowering of thermal stability at higher coupling content ($>$ 1.0% wt) when the silane used as integral blend additive. These results are also in accordance with lowering of mechanical properties at such situations.

DEDICATED TO MY FATHER

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