



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Programme of Study : Ph.D.
Thesis Title: **Development of Ultra-Fine Slag Based Geopolymer Mortar and Concrete for Repairing and Strengthening of Reinforced Concrete Beams**
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Thesis Submitted to the Department/ Center : Civil Engineering
Date of completion of Thesis Viva-Voce Exam : 28/03/2019
Key words for description of Thesis Work : Slag, flyash, reinforced concrete, repairing, strengthening

SHORT ABSTRACT

Geopolymer is an emerging material that has found profound research attention in construction industry as sustainable supplementary cementitious material. Geopolymer being able to offer early strength, needs further study for its application in repairing and strengthening of reinforced concrete structures. The present thesis deals with the development of ultra-fine ground granulated blast furnace slag based geopolymer mortar and concrete for using them as repairing and strengthening agent for concrete structures. The slag based geopolymer mortar and concrete exhibited superior fresh and hardened state properties including bond strength compared to Portland cement mortar and concrete. The early strength gain property of the slag based geopolymer mortar and concrete supported its potential for being used as repairing and jacketing agent in damaged reinforced concrete structures. The reinforced concrete beams that were repaired or jacketed using slag based geopolymer mortar and concrete were either in fully damaged, partially damaged and/or undamaged state prior to the repairing or jacketing. The reinforced concrete beams that were repaired and jacketed using slag based geopolymer mortar and concrete exhibited appreciable performance when loaded under monotonic static load condition. The results of geopolymer mortar and concrete jacketed beams in terms of strength, ductility and stiffness degradation were superior compared to Portland cement concrete. Due to superior bond strength of geopolymer mortar and concrete, the repaired and jacketed beams exhibited better ductility than controlled beams. Slag based geopolymer mortar and concrete repaired and jacketed beams exhibited appreciable performance even at early age of 3 days. The levels of damage also influenced the behaviour of the repaired and jacketed beams. Undamaged or partially damaged beams showed better performance compared to damaged ones when repaired or jacketed.