-Transverse Diaphragms and Unbonded CFRP Transverse Post Tensioning in Side-by-Side Box Beam Bridges

Nabil Grace, Elin Jensen, Vasant Matsagar, Eslam Soliman, Joseph Hanson

Abstract:

Keywords:

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A New Latex Modified Mortar Incorporating Carbon Nanotubes: Preliminary Investigations

Soliman, E. M., Kandil, U. F. and Reda Taha, M.M.

Abstract:

Keywords:

Published In:

ACI-SP ,
( 3 )

Flexural Behavior of Side-By-Side Box-Beam Bridges - A Comparative Study

Nabil Grace, Kapil Patki, Eslam Soliman and Joseph Hanson

Abstract:

Keywords:

Published In:

PCI Journal, 56 (3), pp. 94-112
Limiting Shear Creep of Epoxy Adhesive at the FRP-Concrete Interface Using Carbon Nanotubes at the FRP-Concrete Interface

Soliman, E. M., Kandil, U. F. and Reda Taha, M. M.

Abstract:

Keywords:

Published In:

International Journal for Adhesion and Adhesives, 33, pp. 36-44
The Significance of Carbon Nanotubes on Styrene Butadiene Rubber (SBR) and SBR Modified Mortar

Soliman, E. M., Kandil, U. F. and Reda Taha, M. M.

Abstract:

Keywords:

Published In:

Materials and Structures, 45 (6), pp. 803-816
On and off-axis tension behaviour of fiber reinforced polymer (FRP) composites incorporating multi-walled carbon nanotubes

Soliman, E. M., Al-Haik, M. and Reda Taha, M.M.

Abstract:

Keywords:

Published In:

Journal of Composite Materials, 46 (14), pp. 1661-1675
Low Velocity Impact of Thin Woven Carbon Fabric Composites Incorporating Carbon Nanotubes

Soliman, E. M., Shyka, M. P. and Reda Taha, M. M.

Abstract:

Keywords:

Published In:

International Journal of Impact Engineering, 47, pp. 39-47
Improved Strength and Toughness of Carbon Woven Fabric Composites with Functionalized MWCNTs

Soliman, E., Kandil, U., and Taha, M. R.

Abstract:

Keywords:

Published In:

Materials, 7(6), pp. 4640-4657
Investigation of FRP Lap Splice Using Epoxy Containing Carbon Nanotubes

Soliman, E. M., Kandil, U. F., and Reda Taha, M. M.

Abstract:

Keywords:

Published In:

Journal of Composites for Construction, 19 (2), 04014045
Improving Fatigue Performance of GFRP Composite Using Carbon Nanotubes

Genedy, M., Daghash, S., Soliman, E., and Taha, M. M. R.

Abstract:

Keywords:

Published In:

Fibers, 3 (1), pp. 13-29
Interlaminar Fracture Toughness of CFRP Laminates Incorporating Multi-Walled Carbon Nanotubes

Elisa Borowski, Eslam Soliman, Usama F Kandil, Mahmoud Reda Taha

Abstract:

Carbon fiber reinforced polymer (CFRP) laminates exhibit limited fracture toughness due to characteristic interlaminar fiber-matrix cracking and delamination. In this article, we demonstrate that the fracture toughness of CFRP laminates can be improved by the addition of multi-walled carbon nanotubes (MWCNTs). Experimental investigations and numerical modeling were performed to determine the effects of using MWCNTs in CFRP laminates. The CFRP specimens were produced using an epoxy nanocomposite matrix reinforced with carboxyl functionalized multi-walled carbon nanotubes (COOH-MWCNTs). Four MWCNTs contents of 0.0%, 0.5%, 1.0%, and 1.5% per weight of the epoxy resin/hardener mixture were examined. Double cantilever beam (DCB) tests were performed to determine the mode I interlaminar fracture toughness of the unidirectional CFRP composites. This composite material property was quantified using the critical energy release rate, GIC. The experimental results show a 25%, 20%, and 17% increase in the maximum interlaminar fracture toughness of the CFRP composites with the addition of 0.5, 1.0, and 1.5 wt% MWCNTs, respectively. Microstructural investigations using Fourier transform infrared (FTIR) spectroscopy and X-ray photoelectron spectroscopy (XPS) verify that chemical reactions took place between the COOH-MWCNTs and the epoxy resin, supporting the improvements experimentally observed in the interlaminar fracture toughness of the CFRP specimens containing MWCNTs. Finite element (FE) simulations show good agreement with the experimental results and confirm the significant effect of MWCNTs on the interlaminar fracture toughness of CFRP.

Keywords:

carbon nanotubes; fracture toughness; FTIR; XPS; finite element modeling

Published In:

Polymers, 7(6), pp. 1020-1045
Use of Unbonded CFRP Strands in Transverse Post-Tensioning in Box-Beam Bridges

Nabil Grace, Elin Jensen, Vasant Matsagar, Eslam Soliman and Joseph Hanson

Abstract:

Published In:

International Conference on Advances in Concrete, Structural and Geotechnical Engineering (ACGSE-2009)
Creep and Relaxation of Osteoporotic Bones

Salas, C., Neidigk, S., Soliman, E., Mercer, D. and Reda Taha, M.M.

Abstract:

Keywords:

Published In:

Proceedings of Annual Conference of Society of Experimental Mechanics
Effect of Carbon Nanotube Growth Conditions on Strength and Stiffness of Carbon and Glass Fiber Polymer Composites

Dai, J., Soliman, E., Safdari, M, Al-Haik, M., Reda Taha, M. M.

Abstract:

Keywords:

Published In:

51st Structures, Structural Dynamics, and Materials AIAA Conference , ,
Fracture Toughness of Hydrated Cement Using Nanoindentation

Reinhardt, A., Soliman, E., Sheyka, M., Al-Haik, M., Reda Taha, M.M.

Abstract:

Keywords:

Published In:

Proceedings of 7th International Conference on Fracture Mechanics of Concrete and Concrete Structures (FraMCoS-7)
Creep of Fiber Reinforced Polymer-Epoxy-Concrete Interface Incorporating Carbon Nanotubes

Soliman, E., Kandil, U.F., Reda Taha, M.M.

Abstract:

Keywords:

Published In:

Proceedings of the First Middle East Conference on Smart Monitoring, Assessment and Rehabilitation of Civil Structures (SMAR)
Carbon Nanotubes for Shortening FRP Lap Splice

Soliman, E., Kandil, U. F., Reda Taha, M.M.

Abstract:

Keywords:

Published In:

Proceedings of 6th International Conference on Advanced Composite Materials in Bridges and Structures (ACMBS),
( 18 )

Flexure Response of Multi-Scale Thin Woven Carbon Fabric Epoxy Composites Reinforced By Multi-Walled Carbon Nanotubes

Soliman, E., Kandil, U. F., and Reda Taha, M. M

Abstract:

Keywords:

Published In:

16th International Conference on Petroleum, Mineral Resources & Development (PMRD)
Interlaminar Fracture Toughness of Woven Fabric Composites Reinforced with MWCNTs

Soliman, E., Kandil, U. F., and Reda Taha, M. M.

Abstract:

Keywords:

Published In:

Proceedings of the 9th International Conference of Composite Science and Technology, pp. 320-329
Fatigue of Glass Fiber Reinforced Polymer (GFRP) Incorporating Carbon Nanotubes

Daghash, S. M., Griffin, A., Soliman, E., and Reda Taha, M. M.

Abstract:

Keywords:

Published In:

Proceedings of the 9th International Conference of Composite Science and Technology, pp. 309-319
Improving Tensile Strength of GFRP Using Carbon Nanotubes

Genedy, M., Daghash, S., Soliman, E., and Taha, M. M. R.

Abstract:

Keywords:

Published In:

The 7th International Conference on FRP Composites in Civil Engineering, International Institute for FRP in Construction, ,
Fracture Toughness of Carbon Fiber Laminates Including Carbon Nanotubes

Borowski, E., Aboubakr, S. H., Soliman, E., Reda Taha, M. M.

Abstract:

Keywords:

Published In:

Improving Impact Resistance of Polymer Concrete Using CNTs

Sherif M Daghash, Eslam M Soliman, Usama F Kandil, Mahmoud M Reda Taha

Abstract:

Polymer concrete (PC) has been favoured over Portland cement concrete when low permeability, high adhesion, and/or high durability against aggressive environments are required. In this research, a new class of PC incorporating Multi-Walled Carbon Nanotubes (MWCNTs) is introduced. Four PC mixes with different MWCNTs contents were examined. MWCNTs were carefully dispersed in epoxy resin and then mixed with the hardener and aggregate to produce PC. The impact strength of the new PC was investigated by performing low-velocity impact tests. Other mechanical properties of the new PC including compressive, flexural, and shear strengths were also characterized. Moreover, microstructural characterization using scanning electron microscope and Fourier transform infrared spectroscopy of PC incorporating MWCNTs was performed. Impact test results showed that energy absorption of PC with 1.0 wt% MWCNTs by weight of epoxy resin was significantly improved by 36 % compared with conventional PC. Microstructural analysis demonstrated evidence that MWCNTs significantly altered the chemical structure of epoxy matrix. The changes in the microstructure lead to improvements in the impact resistance of PC, which would benefit the design of various PC structural elements.

Keywords:

polymer concrete, carbon nanotubes, impact strength, microstructure, cracking

Published In:

International Journal of Concrete Structures and Materials, 10(4), 539-553
Improving shear strength of bolted joints in pultruded glass fiber reinforced polymer composites using carbon nanotubes

Moneeb Genedy, Rahulreddy Chemareddy, Eslam M Soliman, Usama F Kandil, Mahmoud M Reda Taha

Abstract:

The structural design of the bolted fiber reinforced polymer elements is typically governed by the capacity of the joint rather than the fiber reinforced polymer member, while the joint capacity is typically governed by the shear strength of the fiber reinforced polymer. Here, the possibility of improving the shear strength of bolted joints is investigated in the unidirectional glass fiber reinforced polymer plates by incorporating the multiwalled carbon nanotubes during glass fiber reinforced polymer fabrication. Glass fiber reinforced polymer double-shear bolted lap joints were fabricated using up to 1.0 wt% multiwalled carbon nanotubes-epoxy nanocomposites. Finite element modeling using multicontinuum theory and element deletion techniques was performed to explain the joint behavior. The experimental investigations show that incorporating multiwalled carbon nanotubes improved the shear strength, ductility, and energy absorption significantly. Microstructural analysis proves that a chemical reaction between multiwalled carbon nanotubes and epoxy improves the shear strength of the matrix.

Keywords: Glass fiber reinforced polymer, carbon nanotubes, bolted joints, ductility, toughness

Published In: Journal of Reinforced Plastics and Composites, 36(13), 958 - 971
Examining Energy Dissipation of Deployable Aerospace Composites Using Matrix Viscoelasticity

Arafat I Khan, Elisa C Borowski, Eslam M Soliman, Mahmoud M Reda Taha

Abstract:

The ability to fold and deploy lightweight composites without damage makes them attractive for aerospace applications. However, one of the challenges faced with deployable composites is their high stiffness, which results in a relatively high deployment rate. It has been hypothesized that by exploiting the time-dependent viscoelastic response of composites, the deployment process could be controlled. To investigate this hypothesis, the effect of matrix viscoelasticity on energy dissipation of a three-layer carbon fiber-reinforced polymer (CFRP) composite laminate, known as a composite tape spring, was examined during the stowage state. A time-dependent implicit finite-element model was generated and implemented to simulate the viscoelastic behavior of the orthotropic laminated CFRP composite tape spring. The implemented material model was verified against data from the literature, validated experimentally, and then used to investigate the significance of matrix stress relaxation on energy dissipation of the three-layer CFRP composite tape spring used in aerospace applications.

Keywords:

Carbon fiber-reinforced polymer (CFRP) composite; Deployable structures; Viscoelasticity; Lamina

Published In:

Journal of Aerospace Engineering , 30(5) , NULL
Bayesian simulation and sensitivity analysis for modeling of single fiber pullout test

E Soliman, AA Nassr

Abstract:

In Fiber Reinforced Concrete (FRC), the use of short and long fibers is essential for controlling shrinkage and microcracks and/or providing ductility. The contribution of fibers to FRC performance depends on the intrinsic properties of both fibers and cementitious matrix and on the fibers distributions. In addition, single fiber pullout remains one of the most crucial testing that leads to more understanding of the behavior of FRC mixtures. As a result, fiber pullout experiments and modeling techniques have been developed and reported extensively over the last three decades. The majority of the reported work assumes deterministic properties for fibers, matrix, and interface when analyzing the behavior of fiber pullout response. This paper studies the effect of the statistical variation of the intrinsic properties of fiber, matrix and their interface on the mechanical performance of single fiber pullout. Sensitivity analysis was…

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Published In:

Composite Interfaces, NULL, NULL