

Article

# Influence of Infiltration Pressure on the Microstructure and Properties of 2D-CFRP Prepared by the Vacuum Infiltration Hot Pressing Molding Process

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**Abstract:** The critical infiltration pressures of the matrix in a two-dimensional (2D) carbon fiber preform were calculated theoretically, and the calculated values of the static and dynamic models were 0.115 and 0.478 MPa, respectively. Compared with the dynamic model, there is no viscous resistance or infiltration front gas pressure in the static model, so the static value is obviously lower than the dynamic value. To verify the rationality of theoretical calculation, 2D carbon fiber reinforced plastics (2D-CFRP) with infiltration pressures of 0.5, 0.6, 0.7, 0.8, and 0.9 MPa were prepared by the vacuum infiltration hot pressing molding process. The microstructure of the composite was observed and the bending strength was tested by three-point bending test. The results show that the infiltration pressure has an important influence on the infiltration effect and the bending fracture morphology. When the infiltration pressure is 0.7 MPa, the composite has an excellent infiltration effect. The fibers distribute reasonable in the fracture. Stress can be effectively transferred when the composite material is loaded. And the bending strength of the composite material reaches 627 MPa at this time.

**Keywords:** infiltration pressure; vacuum infiltration hot pressing molding process; 2D-CFRP; microstructure and properties; influence

## 1. Introduction

Carbon fiber reinforced resin matrix composite has a series of outstanding properties, such as low density, high specific strength, high specific modulus, chemical corrosion resistance, high thermal conductivity, and low thermal expansion coefficient [1,2]. It is widely used in aerospace, military, and automobile industries, electronics, and civil engineering [3,4]. The infiltration process is one of the most important steps in preparing 2D-CFRP by the vacuum infiltration hot pressing molding process. To prepare 2D-CFRP with excellent properties, the matrix needs be sufficiently and uniformly infiltrated in the 2D carbon fiber preform. Otherwise, there will be pores or local non-infiltration among the carbon fiber bundles, and carbon fibers cannot play the role of reinforcement effectively, which will greatly affect the microstructure and properties of 2D-CFRP [5]. The experimental results show that the infiltration effect of matrix in a 2D carbon fiber preform is partly determined by the infiltration pressure. If the infiltration pressure is too low, the matrix in the 2D carbon fiber preform is not sufficient and uniform. If the infiltration pressure is too high, the composite will produce cracks

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**Effects of the Drought of 1980-81 on Streamflow and on Ground-water Levels in Georgia** Robert F. Carter, 1983

Drylands under the Influence of Climate Change and Human Activities Zhiming Han, Mou Leong Tan, Jing Zhao, Xiaoping Wang, Song Feng, 2025-12-19 Covering over 40 percent of the Earth's land area and inhabited by more than 38 percent of the world's population drylands are very sensitive to climate change and human activities These areas characterized by low soil fertility possess a heightened vulnerability to both climate warming and land degradation due mostly to human activities Numerous studies have highlighted the expansion of drylands in the context of global warming Therefore maintaining the ecological balance and ensuring sustainable economic development of the drylands are critical for the overall global environment and economy The escalating drought exacerbated warming and rapid population growth are intensifying dryland expansion resulting in a multitude of potential risks such as reduced carbon sequestration regional warming land degradation and desertification As environmentally sensitive and economically vulnerable areas the ecosystems and society in drylands will confront even more formidable challenges in a future warmer world with a rapidly growing population Hence there is an urgent need for in depth exploration and understanding of the change in dryland regions and their underlying mechanisms The objective of this Research Topic is to explore the change in drylands and the underlying mechanisms in the context of climate change and human activities This endeavor will play a pivotal role in enhancing our comprehension and formulation of appropriate mitigation and adaptive strategies contributing to global stability and sustainable development Contributions must improve our knowledge and understanding of dryland change processes and may include topics such as but not limited to the following Climate change and dryland expansion Hydroclimatic variability in drylands and their underlying physical mechanisms Land air system interactions in drylands Past and future changes of weather and climate extremes in drylands Changes in water and energy balance and the driving forces Modeling the water carbon cycle in dryland ecosystems Response of dryland vegetation to climate change and human activities Change in ecosystem patterns and enhancement of services in drylands Biogeochemical cycles and fluxes e.g. carbon geochemistry and isotopes

**Intermedia Pollutant Transport** David T. Allen, Yoram Cohen, Isaac R. Kaplan, 2012-12-06 The National Center for Intermedia Transport Research NCITR was established at UCLA in 1982 by EPA as one of six Centers of Excellence for the study of environmental pollution problems One of the functions undertaken by the NCITR has been to hold periodic workshops and to provide a forum for the discussion of current topics in the environmental pollution arena To this end two

other workshops have previously been held The first held in November 1982 was chaired by H R Pruppacher R G Semonin and W G N Slinn on Precipitation Scavenging Dry Deposition and Resuspension The second held in January 1986 was chaired by Y Cohen on Pollution Transport and Accumulation in a Multimedia Environment The present workshop chaired by D T Allen Y Cohen and I R Kaplan was held on August 24-26 1988 in Santa Monica California The title of the workshop was Intermedia Pollutant Transport Modeling and Field Measurements Approximately one hundred individuals participated and twenty five papers were given mostly by invitation The workshop was divided into the following four broad topics 1 Transport of Pollutants from the Atmosphere 2 Transport of Pollutants from Soils and Groundwaters 3 Transport of Pollutants from Lakes and Oceans and 4 Multimedia Transport of Pollutants The last afternoon was reserved for a Panel Discussion

*High Performance Structural Material* Yafang Han, Qiang Zhang, Bin Jiang, 2015-04-01 Selected peer reviewed papers from the Chinese Materials Congress 2014 CMC 2014 July 4-7 2014 Chengdu China *Hydro-mechanical Analysis of Rainfall-Induced Landslides* Lizhou Wu, Runqiu Huang, Xu Li, 2020-01-14 Most landslides are triggered by rainfall In previous studies slope stability is often evaluated based on the infiltration analysis Hydro mechanical coupling is significant to rainfall caused landslide evolution This book covers theoretical models of unsaturated infiltration and provides hydro mechanical models for rainfall induced landslides The influences of rainfall patterns boundary conditions layered structures and SWCC hysteresis on the coupled unsaturated infiltration and deformation are discussed Laboratory testing of rainfall induced landslides is performed to study the developing process of landslide upon rainfall infiltration The results provide a better understanding of rainfall induced landslides **Influence of Spatial Variability and Scale Effects on the**

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