

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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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 *Progress in Materials and Processes* Zhi Ming Shi,Jun Hui Dong,Wen Ma,2012-12-13 Selected papers from the 2nd International Conference on Materials and Products Manufacturing Technology ICMPMT 2012 September 22 23 2012 Guangzhou China *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 **Fiber Reinforced Ceramic Composites** K.S. Mazdianasni,1990-12-31 Provides the first comprehensive treatment of continuous and discontinuous ceramic fiber and whisker reinforced ceramic composites written by 29 authorities in the field **Influence of Spatial Variability and Scale Effects on the Parameterization of Hydrologic Response** Eric F. Wood,1987 [Journal of Hydrology and Hydromechanics](#) ,1993 [Encyclopedia of Agrophysics](#) Jan Gliński,Józef Horabik,Jerzy Lipiec,2011-06-07 This Encyclopedia of Agrophysics will provide up to date information on the physical properties and processes affecting the quality of the environment and plant production It will be a first up volume which will nicely complement the recently published Encyclopedia of Soil Science November 2007 which was published in the same series In a single authoritative volume a collection of about 250 informative articles and ca 400 glossary terms covering all aspects of agrophysics will be presented The authors will be renowned specialists in various aspects in agrophysics from a wide variety of countries Agrophysics is important both for research and practical use not only in agriculture but also in areas like environmental science land reclamation food processing etc Agrophysics is a relatively new interdisciplinary field closely related to Agrochemistry Agrobiolgy Agroclimatology and Agroecology Nowadays it has been fully accepted as an agricultural and environmental discipline As such this Encyclopedia volume will be an indispensable working tool for scientists and practitioners from different disciplines like agriculture soil science geosciences environmental

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