Accepted Manuscript

Intrinsic cohesive modeling of impact fracture behavior of laminated glass

Wei Gao, Jibang Xiang, Shunhua Chen, Shuohui Yin, Mengyan Zang, Xuejun Zheng

PII: DOI: Reference:

S0264-1275(17)30416-1 doi: 10.1016/j.matdes.2017.04.059 **JMADE 2981**



To appear in:

Received date: 25 December 2016 Revised date: 14 April 2017 Accepted date: 17 April 2017

Please cite this article as: Wei Gao, Jibang Xiang, Shunhua Chen, Shuohui Yin, Mengyan Zang, Xuejun Zheng, Intrinsic cohesive modeling of impact fracture behavior of laminated glass, (2017), doi: 10.1016/j.matdes.2017.04.059

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Intrinsic cohesive modeling of impact fracture behavior of laminated glass

Wei GAO^{a,*}, Jibang XIANG^a, Shunhua CHEN^b, Shuohui YIN^a, Mengyan ZANG^c, Xuejun ZHENG^{a,*}

^aEngineering Research Center for Complex Track Processing Technology and Equipment, School of Mechanical Engineering, Xiangtan University, Hunan, People's Republic of China

^bDepartment of Systems Innovation, the University of Tokyo, Tokyo, Japan ^cSchool of Mechanical and Automotive Engineering, South China University of Technology, Guangzhou, People's Republic of China

Abstract

Automotive laminated glass is generally composed of two pieces of outer glass layers and one piece of polyvinyl butyral (PVB) interlayer. Its impact fracture behavior is very important to the safety of drivers, passengers and pedestrians. The objective of this work is to numerically investigate the impact fracture behavior of laminated glass via an intrinsic cohesive model (CM). To achieve this end, we propose a laminated glass model by inserting cohesive elements on all common surfaces of solid finite elements (FEs) in glass layers prior to simulations and describing the nonlinear characteristic of PVB by using the generalized Mooney-Rivlin (MR) model. Besides, the difference between this MR model and another one commonly used MR model is investigated. Then, the impact fracture process of a laminated glass plate is simulated, and the proposed approach is verified by comparing the numerical results with the corresponding experimental observations. Afterwards, parametric studies are performed to investigate the influence of the cohesive penalty stiffness and the strength of glass. Finally, the effects of the stiffness of the PVB film, the support conditions and the thicknesses of glass layers on the impact force history, the cracking and the kinetic energy loss of the impactor are investigated.

Preprint submitted to Materials and Design

April 23, 2017

^{*}Corresponding author: Wei GAO, Xuejun ZHENG

Email addresses: hbweigao@126.com (Wei GAO), zhengxuejun@xtu.edu.cn (Xuejun ZHENG)

Download English Version:

https://daneshyari.com/en/article/5023668

Download Persian Version:

https://daneshyari.com/article/5023668

Daneshyari.com