

论文

梯度陶瓷水煤浆喷嘴的残余热应力有限元分析

员冬玲<sup>1</sup>, 邓建新<sup>1</sup>, 丁泽良<sup>2</sup>, 段振兴<sup>1</sup>

1. 山东大学机械工程学院, 山东 济南 250061; 2. 湖南工业大学机械工程学院, 湖南 株洲 412008

摘要:

根据陶瓷水煤浆喷嘴出口破损和脱落的主要原因, 提出了梯度功能陶瓷喷嘴的设计思想, 目的是人为的在喷嘴的制备过程中在喷嘴的出口处形成有利的残余压应力, 缓和喷嘴在使用中的拉应力. 通过合理地设计梯度功能陶瓷喷嘴不同部位材料组分的分布, 设计了两种模型: 轴向梯度陶瓷喷嘴FGM-Z, 径向梯度陶瓷喷嘴FGM-R. 利用有限元法对两种模型进行了分析, 得出: 两种梯度喷嘴模型在出口处均形成了有利的压应力, 特别是FGM-R喷嘴在喷嘴的整个内壁都形成了有利的压应力. 通过比较, 初步确定最佳模型为FGM-R陶瓷水煤浆喷嘴.

关键词: 喷嘴 梯度功能材料 残余热应力

Finite element analysis for the thermal residual stress of gradient CWS ceramic nozzles

YUAN Dong-ling<sup>1</sup>, DENG Jian-xin<sup>1</sup>, DING Ze-liang<sup>2</sup>, DUAN Zhen-xing<sup>1</sup>

1. School of Mechanical Engineering, Shandong University, Jinan 250061, China; 2. School of Mechanical Engineering, Hunan University of Technology, Zhuzhou 412008, China

Abstract:

According to the main reason of the cause of failure at the exit surface of the CWS ceramic nozzle, the gradient function material (FGM) theory was applied into the design and manufacture of CWS ceramic nozzle material, which aimed to induce a compressive residual stress and reduce the tensile stress at the entry area of the FGM ceramic nozzles. The coefficients of thermal expansion of the constituent phases and neighboring layers, the physical models of FGM-Z and FGM-R were set up by the optimum component distribution. Analyzing by FEM, the results show that available compressive stress fields are found to exist in the two FGM nozzles, especially in the inner-hole surface of FGM-R ceramic nozzle. The design model of FGM-R was determined by comparison.

Keywords: nozzle functionally gradient material thermal residual stress

收稿日期 2007-03-16 修回日期 1900-01-01 网络版发布日期 2008-04-16

DOI:

基金项目:

通讯作者: 员冬玲

作者简介:

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