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Effect of stress relaxation on sealing performance of the fabric rubber seal

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Abstract

In this paper, the effects of stress relaxation on the sealing performance of the fabric rubber seal are studied under pressure difference and compressive displacement. First, the prediction method about the gas leakage rate of the fabric rubber seal is presented based on the viscoelastic theory and the microchannel model. Second, both the average contact stress and the contact length of the fabric rubber seal are obtained under the pressure difference by means of the finite element method (FEM), and the gas leakage rate of the microchannel model for the fabric rubber seal is calculated using the computational fluid dynamics (CFD) method. Finally, the influences of stress relaxation on the gas leakage rate of the fabric rubber seal are analyzed under different pressure difference and compressive displacement, which indicates that the numerical simulation results are in good agreement with the experimental results.

Key words: fabric rubber seal; stress relaxation; sealing performance; microchannel; contact stress

1. Introduction

Fabric rubber composite is a kind of advanced seal material which is widely used in the engineering field of aerospace, high-speed rails, machine tools and so on. In

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