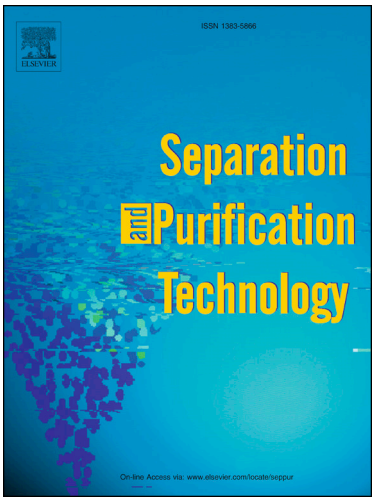

Influence of pleat geometry on the filtration and cleaning characteristics of filter media

Shihang Li, Shuda Hu, Biao Xie, Hao Jin, Jie Xin, Fei Wang, Fubao Zhou

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Influence of pleat geometry on the filtration and cleaning characteristics of filter media

Shihang Li [a, b], Shuda Hu [a, b], Biao Xie [a, b], Hao Jin [a, b], Jie Xin [a, b], Fei Wang [a, b], Fubao Zhou [a, b, c,*]

([a] Key Laboratory of Coal gas and Fire Control, Ministry of Education, China University of Mining and Technology, Xuzhou 221116, China;
[b] School of Safety Engineering, China University of Mining and Technology, Xuzhou 221116, China;
[c] State Key Laboratory of Coal Resources and Mine Safety, China University of Mining and Technology, Xuzhou 221116, China)

Abstract:

The aim of this study is to analyze the influence of pleat geometry on the filtration and cleaning characteristics of the filter media through experiment. Six kinds of test chambers were designed to study the conventional filter media and the coated filter media with varying pleat ratio (the ratio of pleat height to pleat pitch). The experimental results showed that pleat geometry significantly influenced the pressure drop and the cleaning adhesive force in the two kinds of filter media. The effect of pleat geometry on the parameters of the dust cake was also studied in this work. The regeneration efficiency of conventional and coated filter media all gradually decreased with increasing pleat ratio, and the latter was higher than the former. The analysis of the experimental data and the theoretical equations revealed that the effective filtration area was mainly influenced by the pleat ratio and the pleat ratio should be kept to be below 1.59. The relationship between the effective filtration area and the pleat ratio for the conventional and coated filter media can be described by mathematical models.

Keywords: pleat geometry; pressure drop; effective filtration area; pleated filter cartridge

1. Introduction

Air purification is a major concern in many sectors of industry. Pleated cartridge filters are widely used in the field of air pollution control due to their high collection efficiency, low resistance, small footprint, and so on [1-7]. Pleated filter cartridges have smaller volume than cylindrical filter bags for the same filtration area, owing to their pleat geometry, and hence, pleated filter cartridges are more applicable in restricted spaces [8, 9]. Although the pleat geometry of a filter media can save space, the filtration and cleaning characteristics of the filter media varies with the pleat ratio. Pleated filter cartridges with a high number of folds are harder to clean than cylindrical filter bags, resulting in incomplete or patchy filter media cleaning [10-12]. The filtration resistance therefore becomes larger, and it is necessary to take into account both the space saving and the filtration resistance.

Park et al. [13] designed multiple types of pleated filter cartridges by changing pleat angle, pleat length, and number of pleats to get an optimum pleat ratio and found that the highest cleaning efficiency and best cleaning interval were achieved under the pleat ratio of 1.48.

* Corresponding author at: School of Safety Engineering, China University of Mining and Technology, Xuzhou 221116, China.
E-mail addresses: f.zhou@cumt.edu.cn (F. Zhou).