

Chemical Degradation of a Polyester Nonwoven Membrane Used in Aerosol and Drainage Filter

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Abstract : The filter media in synthetic fibre is the most geotextile materials used in aerosol and drainage filtration, particularly for buildings soil reinforcement in civil engineering due to its appropriated properties and its low cost. However, the current understanding of the durability and stability of this material in real service conditions, especially under severe long-term conditions are completely limited. This study has examined the effects of the chemical aging of a filter media in polyester nonwoven under different temperatures (50, 70 and 80°C) and pH (2, 7 and 12). The effect of aging conditions on mechanical properties, morphology, permeability, thermal stability and molar weigh changes is investigated. The results showed a significant reduction of mechanical properties in term of tensile strength, puncture force and tearing forces of the filter media after chemical aging due to the chemical degradation. The molar mass and mechanical properties changes in different temperature and pH showed a complex dependence of material properties on environmental conditions. The SEM and AFM characterizations showed a significant impact of the thermal aging on the morphological properties of the fibres. Based on the obtained results, the lifetime of the material in different temperatures was determined by the use of the Arrhenius model. These results provide useful information to better understand phenomena occurring during chemical aging of the filter media and may help to predict the service lifetime of this material in real used conditions.

Keywords : nonwoven membrane, chemical aging, mechanical properties, lifetime, filter media

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