

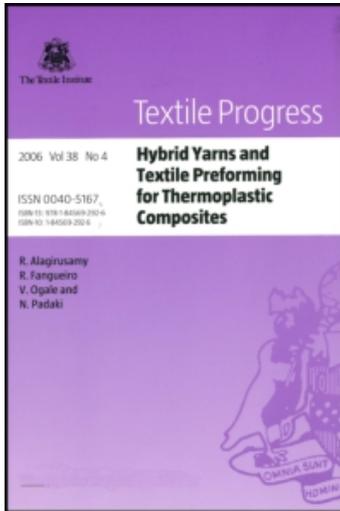
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WETTING AND WICKING IN FIBROUS MATERIALS

A. Patnaik¹, R. S. Rengasamy, V. K. Kothari and A. Ghosh

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Abstract: This issue reviews developments in wetting and wicking of fibrous materials, covering characterization of wetting; wetting and wicking of fibers, filaments, yarns, and fabrics; factors affecting wetting and wicking of fibrous assemblies; mathematical models of wetting and wicking; and application areas of the same.

Key words: Wetting, wicking, fibrous materials.

1. INTRODUCTION

Wetting and wicking are important phenomena in the processing and applications of fibrous materials. Various aspects of liquid–fiber interactions such as wetting, transport, and retention have received much attention both in terms of fundamental research and for product and process development [1]. In fiber composites, the performance of the composites is governed by the adhesion between the fibers and resin binders. The adhesion between the fibers and resin is influenced by the initial wetting of the fibers by the resin as this decides the subsequent resin penetration between the fibers and voids content. On the other hand, surgical fabrics should not let liquid and solid particles pass through easily. The mechanics of liquid coating are greatly influenced by the combined abilities of the liquid and solid to achieve complete wetting at the given speed of solid motion [2]. Wetting and wicking behavior of fibers is important to describe fluid transport in fibrous media such as filters, coalescers, and sorbents.

A spontaneous transport of a liquid driven into a porous system by capillary forces is termed wicking because capillary forces are caused by wetting; wicking is a result of spontaneous wetting in a capillary system [3]. Wetting is a prerequisite for wicking. A liquid that does not wet fibers cannot wick into a fabric. The wetting and wicking behavior of the fibrous structure is a critical aspect of performance of products such as sports clothes, hygiene disposable materials, and medical products. Wetting and wicking processes occurring during wearing of clothes have a practical significance in clothing comfort.

2. WETTING

Wetting of a fibrous assembly affects many manufacturing processes, as well as the end use performance of materials. Wetting is a complex process complicated further by structure of the fibrous assembly e.g. yarns, woven/nonwoven/knitted fabrics, and pre-forms for composites.

There is clear distinction between two terms that are sometimes used interchangeably,