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Brigitte Camillieri, Marie-Ange Bueno



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Indentation of hairy surfaces: role of friction and entanglement

Brigitte CAMILLIERI, Marie-Ange BUENO

Univ. Haute Alsace, Laboratoire de Physique et Mécanique Textiles, École Nationale Supérieure
d'Ingénieurs Sud-Alsace, 11 rue Alfred Werner, 68093 Mulhouse Cedex, France.

*All correspondence should be addressed to: Marie-Ange Bueno - ENSISA - 11 rue Alfred Werner -
68093 Mulhouse Cedex - France, marie-ange.bueno@uha.fr, Tel: 00 33 (0)3 89 33 63 20, Fax: 00 33
(0)3 89 33 63 39

Abstract:

The present paper is focused on loading-unloading features and hysteresis during indentation of surfaces having a superficial hairiness. Friction between the pile and the indenter and between bristles constituting the pile has been modified in experimental and modelling approaches. The results highlight the influence on stiffness and hysteresis of the friction between the bristles and between the indenter and the bristles. For an oriented straight pile with a fixed length, the indentation behaviour is strongly influenced by the friction between bristles. For a pseudo-random structure in terms of bristles orientation and length, the inter-bristles friction has a lower influence than the friction with the indenter.

Keywords:

Fibre, indentation, friction, textile fabrics.

1. INTRODUCTION

Many surfaces are characterised by emergent fibres, i.e. superficial hairiness, like textile fabrics for garments, carpets or seat upholstery, and some leather or paper surfaces. It is well known that hairiness plays an important role in the frictional and tactile properties of such surfaces. This study focuses on highly hairy surfaces. The objective is to identify, understand and quantify the features influencing the tactile feeling in order to get the desired tactile properties before manufacture.

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