Resum de Tesi Doctoral

UNIVERSITAT POLITÈCNICA DE CATALUNYA
BARCELONATECH
Escola de Doctorat

DNI/NIE/Passaport	46627876E
Nom i cognoms	Judit Gonzalez Bertran
Títol de la tesi	DEVELOPMENT OF DYNAMIC TEXTILES BASED ON SHAPE MEMORY POLYURETHANE (SMPU) FOR APPLICATIONS IN CAR SEAT UPHOLSTERY
Unitat estructural	Departament de Ciència i Enginyeria de Materials
Programa	Programa de Doctorado en Ingeniería Textil y Papelera
Codis UNESCO	332605 230424

(Mínim 1 i màxim 4, podeu veure els codis a http://doctorat.upc.edu/gestio-academica/impresos/tesi-matricula-i-diposit/codis-unesco)

Resum de la tesi de 4000 caràcters màxim (si supera els 4000 es tallarà automàticament)

In recent years, numerous studies have been carried out on functional textiles due to their ability to adapt and interact with the environment. In particular, special focus has been placed on dynamic textiles incorporating shape memory materials (SMMs). The most advanced studies in this field deal with the use of shape memory alloys (SMAs) or with the use of shape memory polymer finishes (SMPs), thoroughly analyzing the dynamism of shape memory and its benefits, mainly in terms of comfort and protection. However, despite the rapid development experienced by SMPs due to their versatility, low cost and easy transformation into different formats such as foams, gels or films, their integration in the form of monofilament/multifilament yarns in textiles has yet to be studied in depth. This integration presents significant manufacturing challenges on an industrial level, both in obtaining fibers of adequate fineness retaining their physical properties and shape memory effect (SME), as well as in their subsequent integration into textiles. Studies are currently underway to improve their processability and the properties of SMP yarns, based on shape memory polyurethanes (SMPUs), with the aim of achieving optimum performance and industrial production. However, research on the implementation of SMPU yarns in textiles and their potential applications is still rather limited and further investigation in this area is required.

This study focuses on the development of dynamic textiles by integrating SMPU yarns in order to increase comfort in vehicle seats. The research was organized into three phases: the fabrication of the SMPU yarn, the incorporation of the yarns into woven fabrics and the application of the developed fabric in vehicle seat upholstery.

The first phase was based on the development and characterization of optimal SMPU yarns for use in textile applications. For this purpose, a system to industrialize the production of SMPU yarn was studied, which included the permanent shape programming and the temporary shape setting in a single process. Different drawing speeds were analyzed with pure and composite SMPU yarn (manufactured using additives, such as multi-walled carbon nanotubes and carbon black, from commercial SMPU pellets). These variations in speed and composition provided a wide range of optimal SMPU yarns for use in textiles, allowing the most suitable yarn to be selected according to the requirements of each application.

The second phase focused on the fabrication of dynamic textiles by integrating different proportions of SMPU yarns and polyester (PES) yarns in woven fabrics. The objective was to evaluate the impact of SMPU yarn content and its integration in the fabric in terms of thermal comfort, shape memory effect (SME) and mechanical strength.

The third phase focused on analyzing dynamic textiles for integration into an innovative application such as vehicle seat upholstery. The dynamism of these textiles, produced by elastic deformation, offers a potential solution to a comfort problem that affects users, causes concern in the automotive sector and thus, has a significant impact on safety. To achieve the objective, three woven fabrics were developed using a combination of SMPU/PES (25:75) with different structures.

The results of the study evidenced the possibility of obtaining SMPU yarns with optimal properties and size for textile use, as well as integrating them properly by weft and warp in the weaving process. In addition, a dynamism was observed in the textile that could considerably increase comfort in upholstery applications for vehicle seats.

Lloc Terrassa Data 29/08/2023

Signatura

Judit Gonzále z Bertran

Firmado digitalmente por Judit González Bertran
Fecha: 2023.09.05 19:12:14 +02'00'