Electrospun Membrane of Thiolated Polyurethane Nanofibers

S. Torresi[1], **D.L. Bohorquez[1]**, U. Montejo[2], A. Alonso-Varona[2], L. Martin[3], N. Gabilondo[1], A. Eceiza[1]

[1] 'Materials+Technologies' Group (GMT), Chemistry and Environmental Engineering Department, Faculty of Engineering of Gipuzkoa, University of the Basque Country (UPV/EHU), Plaza Europa 1, 20018 Donostia-San Sebastián, Spain
[2] Dpto. Biología Celular e Histología, Facultad de Medicina y Enfermería (UPV/EHU), Bº Sarriena s/n, 48940 Leioa, Spain
[3] Macrobehaviour-Mesostructure-Nanotechnology SGIker Service, Faculty of Engineering of Gipuzkoa, University of the Basque Country (UPV/EHU), Plaza Europa 1, 20018 Donostia-San Sebastián, Spain
dinaluz.bohorquez@ehu.eus

Polymeric nanofiber membranes incorporating versatile functionalities are known to be very promising materials in numerous application fields. Segmented polyurethanes (PU) are block copolymers with enormous flexibility in their chemical structure, processing technologies and final properties, and are therefore considered ideal candidates for the development of functional nanofibers [1]. The incorporation of specific chemical moieties into the PU backbone is highly desirable when ulterior physical interactions or chemical reactions are required. In this context, the synthesis of taylor-made PUs is proposed by inserting pendant clickable groups along the main chain, suitable for subsequent click reactions with molecules or polymers suitably functionalyzed with the conjugate, after the electrospinning process.
In this study, two biocompatible biobased PU formulations containing thiol (PU-SH) and maleimide (PU-Mal) pendant groups were synthesized and processed by electrospinning. On the one hand, nanofibers containing thiol moieties were electrospun to obtain membranes. The thiol-maleimide click reation was verified with a fluorescently labeled maleimide model molecule adjusting the pH to 5.5 (Figure 1 Left). On the other hand, PU-SH and PU-Mal were procesed simultaneously by coaxial-electrospinning for the preparation of nanofibers containing thiol and maleimide groups in stoichiometric ratio. Tryethylammine and UV light were used to promote the thiol-michael reaction. The nanofiber membranes were mechanically characterized before and after click reaction, observing an increase in the strength, stiffness and elongation of the clicked membranes (Figure 1 Right).
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References

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Figures

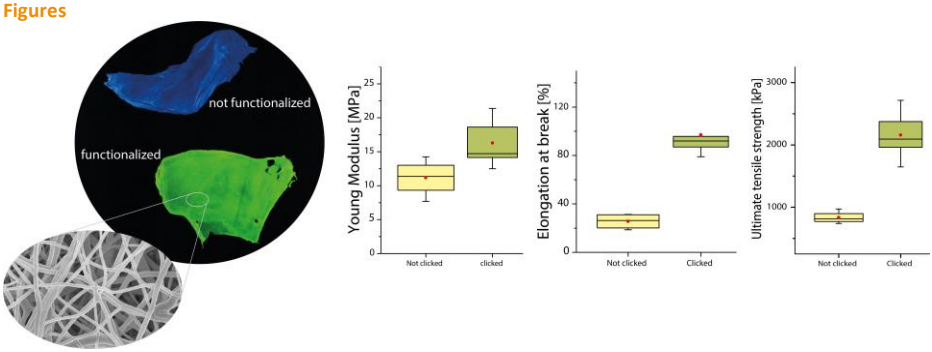

Figure 1: Left: functionalized and not functionalized membranes. Right: Mechanical properties of clicked and not clicked membranes.