SafeBiotrash.Disposal

A safe and responsabile way to gather group III biological residues

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ICDDMAP2021
Public Exhibition 20 - 22 May
International Conference on Direct Digital Manufacturing And Polymers

SUMMARY

The use of personal protective materials has become essential in the fight against the SARS-CoV-2 coronavirus and the COVID-19 disease. These materials, being disposable, generate high quantities of contaminated biological waste, classified as group III hospital waste, placed in closed bins and identified by the colour white. The SafeBiotrash.Disposal project emerges as an innovative methodology for the disposal and collection of this contaminated waste. For this purpose, a bin was developed to safely deposit the waste, not allowing access to the inside of the bag. This reduces the spread of the virus both by the surfaces surrounding the bin and by health professionals.

INTRODUCTION

The emergence of the SARS-CoV-2 coronavirus and the COVID-19 disease has led to the need to reinforce the technological development of new products. According to Order no. 242/96 of the Ministry of Health on 13th August, class III waste, which comprises biohazardous waste such as gloves, masks, gowns and others, must be stored in containers that are easy to handle, resistant, impermeable, hermetically sealed, washable and disinfectable. The project SafeBiotrash.Disposal resulted from the need to overcome/correct the drawbacks of the current bins present in health units. The aim is to provide better safety for health professionals, fewer contagious diseases and easier handling of potentially hazardous waste. In this way, it is intended to introduce into the market a bin that will not allow access to contaminated waste as it will consist of a hydrophobic compartment, suitable for its disposal (fig. 1).

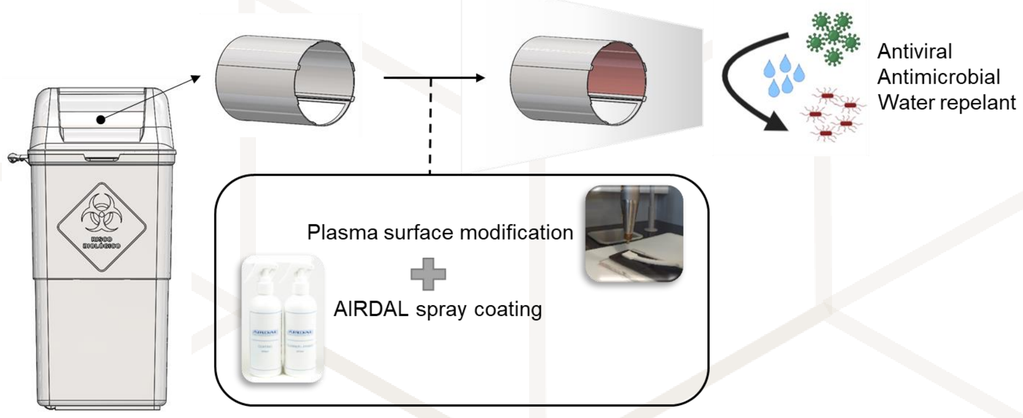

Fig. 1 Squematic diagram of the implemented methodologies.

DEVELOPMENT

A methodology was evaluated to turn the surface of the waste bin compartment hydrophobic and antiviral. For this, two polymers were compared, polypropylene (PP) and polystyrene (PS). For the antiviral property a spray designated AIRDAL® that prevents viruses as SARS-CoV-2 or bacteria from adhering to surfaces was acquired and applied following the manufacturer's instructions (1). For the hydrophobicity, a surface modification plasma equipment (Diener, Germany) was used where the PP was exposed for 2 min and the PS for 20 sec. To validate this methodologies water contact angle and Fourier transform infrared (FTIR) spectroscopy was conducted.

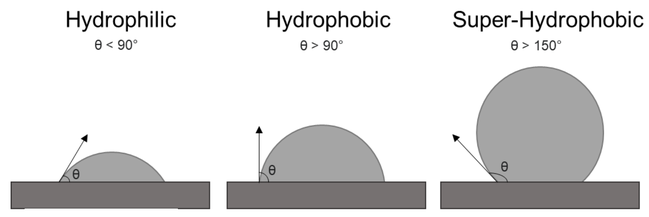

Fig. 2 Water contact angle.

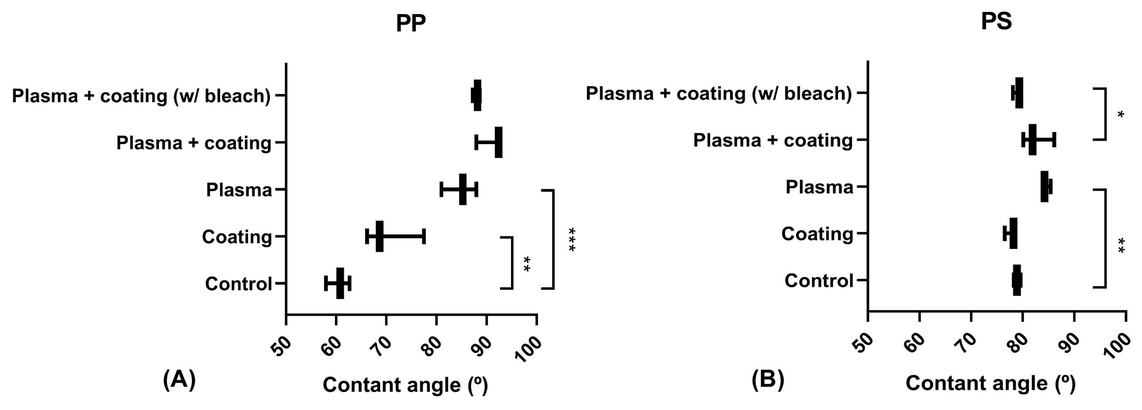

Fig. 3 Water contact angle of PP (A) and PS (B) (N=3). Statistical significant diferences were performed by one-way ANOVA with Fisher´s LSD *post hoc* test, where * p<0.05, ** p <0.01 and *** p <0.001.

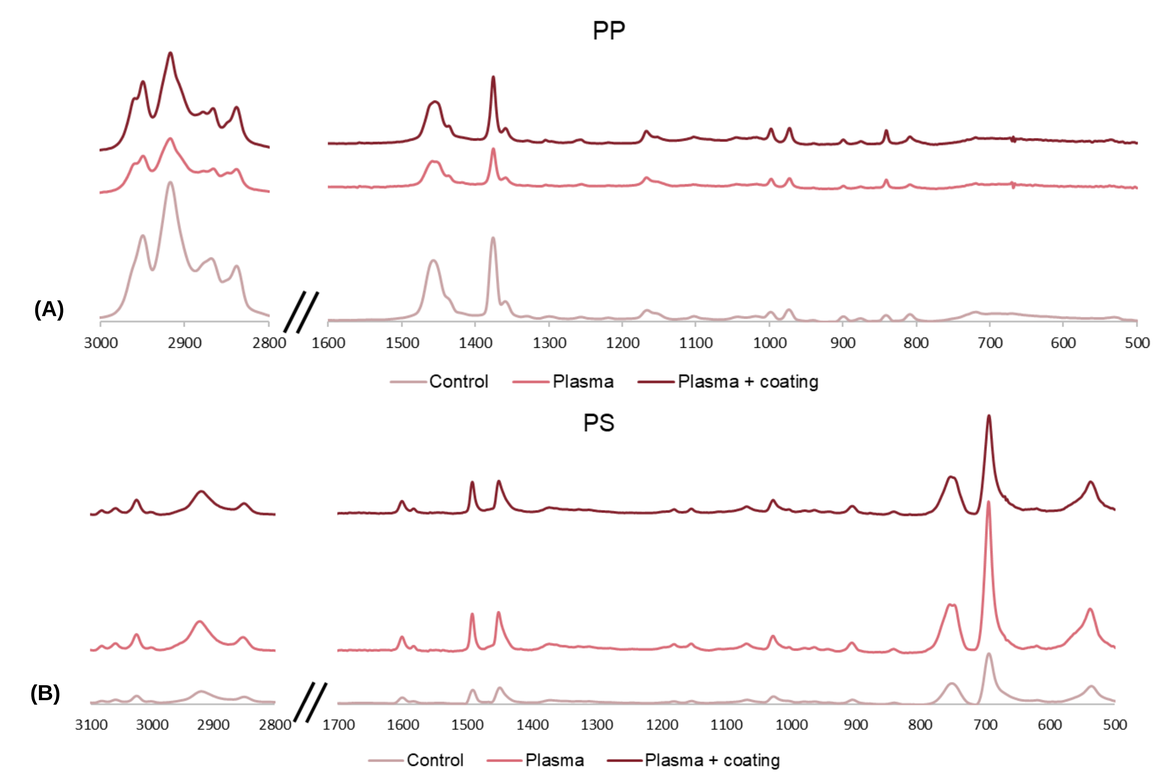

Fig. 4 Fourier transform infrared spectroscopy of PP (A) and PS (B).

Results showed that for both PP and PS the plasma application led to an increase in hydrophobicity (fig. 3). However, not to the desirable values as higher than 90º (fig. 2). Since for PP the coating also proved to be advantageous, a combination of both techniques was performed for both materials. With this methodology we achieved the goal of a hydrophobic surface for the PP that after being submerged in a 50% (v/v) bleach for three days there was no alteration in this property. bleach was used as it is one of the most widely used solutions to clean and disinfect surfaces Regarding FTIR there was no change in the surface of PP and PS indicating that the implemented methodologies did not alter the polymeric chains of the tested materials.

CONCLUSIONS

The combination of plasma treatment and spray coating proved to be a viable approach to modify the surface of PP. Highlighting the fact that the treated surfaces do not need to be cleaned and disinfected as frequently due to the hydrophobic and antiviral properties implemented.

REFERENCES:

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ACKNOWLEDGMENTS:

This work is supported by the Fundação para a Ciência e Tecnologia (FCT) and Centro2020 throught the projects references: UIDB/04044/2020; UIDP/04044/2020; PAMI – ROTEIRO/0328/2013 (Nº 022158) and SafeBiotrash.Disposal (POCI-01-02B7-FEDER-069612).

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