11th International Conference on Advanced Materials
Rio de Janeiro Brazil
September 20 - 25
ICAM2009

Anti-thrombogenic properties of blended Poly (vinyl alcohol)/chitosan film

M. M. S. G. Simões [(1)], R. S. Vieira [(2)] and M. G. de Oliveira[(1)*]

(1) Department of Physical Chemistry, Chemistry Institute, University of Campinas, Campinas, Brazil
(2) Department of Chemical Engineering, Federal University of Ceará, Fortaleza, Brazil,
*Corresponding author.

Abstract – PVA/chitosan blends were prepared with different mass ratios and morphologically characterized by DSC and SEM. Thrombogenic properties of the blends were evaluated through platelet adhesion tests using whole human blood labeled with mepacrine. DSC showed a decrease in T_m and an increase in T_g of the blend compared to pure PVA, indicating a decrease in the mobility of the PVA chains in the blend. Platelet adhesion on the blends was greatly reduced compared to chitosan films. These results show that PVA/chitosan blends can be an option for improving the hemocompatibility of chitosan.

The long-term success of blood-contacting biomaterials has been limited by the occurrence of platelet adhesion and protein adsorption. Chitosan is a partially deacetylated form of chitin, with excellent biocompatibility, biodegradability, hemostatic, and antibacterial activity. However, applications of chitosan in blood-contact materials are precluded because of surface-induced thrombosis. Blending of chitosan has been reported as a strategy to improve blood compatibility. Poly(vinyl alcohol), PVA, is one of the widely used polymers which can be blended with chitosan, to increase its biocompatibility and mechanical properties.

In this work, blends of PVA/Chitosan with different mass ratios were prepared by freezing/thawing cycles, in order to decrease the solubility of PVA domains, and morphologically characterized by Differential Scanning Calorimetry (DSC) and Scanning Electronic Microscopy (SEM). Thrombogenic properties of the blends were evaluated by platelet adhesion tests using mepacrine labeled whole human blood and a Fluorescence Microscope coupled to a digital camera.

SEM micrographs showed that the blended films have a porous morphology, with interconnected cells (data not shown). Table 1 shows the glass transition (T_g) and the melting temperature (T_m) of PVA and PVA/chitosan blend (mass ratio = 7:3). It can be seen that the presence of chitosan in PVA led to an increase in T_g as result of a decrease in the motion of PVA moiety in the blend. Also, the melting temperature of PVA in the blend was decreased 10°C relative to pure PVA, which is an evidence that PVA and chitosan have miscibility in the molecular level, once the crystal morphology was changed after blending. Representative fluorescence micrographs of collagen (positive control), PVA, Chitosan and PVA/Chitosan blend (mass ratio = 7:3) after incubation with whole human blood containing mepacrine labeled platelets are shown in Figure 1. Platelet adhesion on the blends was greatly reduced compared to chitosan films. These results show that PVA/chitosan blends can be an option for improving the hemocompatibility of chitosan.

Table 1: T_g and T_m data of PVA and PVA/chitosan blend

Material	T_g	T_m
PVA	56	185
PVA/chitosan blend	62	175

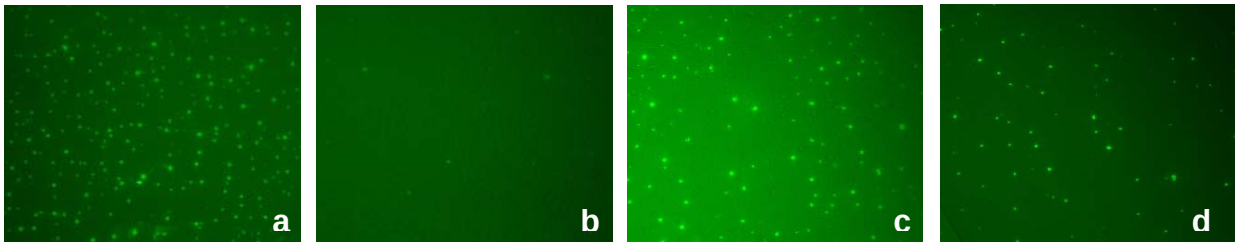

Figure 1: Fluorescence micrographs of collagen (a) (positive control), PVA (b), chitosan (c) and PVA/chitosan blend (mass ratio = 7:3) (d), after incubation with mepacrine labeled whole human blood.

References

[1] Amiji, M. M., Biomaterials, 16, 593–599, 1995.