11th International Conference
on Advanced Materials

Rio de Janeiro Brazil
September 20 - 25

ICAM2009

TGA/DSC characterization and drug release studies for a biocompatible material containing the drug ibuprofen encapsulated into polymeric cellulose acetate

Andrea C. Pio Santos* and Denise de Oliveira Silva

Instituto de Química, Universidade de São Paulo, São Paulo, Brazil; e-mail: acps@iq.usp.br.
* Corresponding author.

Abstract - The combination of drugs with biocompatible polymers is a new technology to improve therapeutic efficacy and to enable a decreasing of the total dose that must be administered to achieve therapeutic response. The present work reports TGA/DSC thermal characterization of a biocompatible material containing the drug ibuprofen encapsulated into polymeric cellulose acetate and studies on drug releasing by using high performance liquid chromatography (HPLC).

Non-steroidal anti-inflammatory drugs are widely consumed to treat inflammatory diseases and pain but their clinical use are limited due to serious side-effects on the gastrointestinal tract. An example of this kind of drugs is ibuprofen (Hibp), a phenylpropionic acid that inhibits prostaglandin synthesis and has anti-pyretic and non narcotic analgesic properties. However, the short half-life coupled to the low single administration dosage necessary make ibuprofen a good candidate for the development of new delivery system formulations.

The combination of drugs with materials such as biocompatible polymers is considered a new technology that meets the goals to improve the therapeutic efficacy and also to enable a decreasing of the total dose that must be administered to achieve therapeutic response, thus minimizing unwanted toxic effects. The spray-drying technique has been successfully employed in the preparation of particulate delivery systems. It is applicable to heat-sensitive materials and presents an easy industrial transposition.

We have reported before [1] a method for preparing ibuprofen/cellulose acetate (Hibp/CAc) mixtures that can be spray-dried to give materials containing ibuprofen encapsulated into cellulose acetate and have concluded that the composition of the starting mixtures affects the morphology and the size of the particles after spray drying: an mixture of Hibp/CAc/Tween80/mineral oil led to micro-particles while a non-oil mixture of Hibp/CAc/Tween80 gave nano-sized particles.

The present work reports TGA/DSC thermal characterization of the material Hibp/CAc/Tween80 and studies on drug releasing by using high performance liquid chromatography (HPLC).

The material undergoes thermal decomposition at the range of 150-450^{o}C that is characterized by exothermic events. The typical endothermic DSC peak that corresponds to the melting point (76 ºC) of Hibp is not observed for the spray-dried solid suggesting that Hibp interacts with CAc in the Hibp/CAc/Tween80 material.

The determination of the amount of Hibp in this material was 10 ± 2% that is in accordance with the starting drug:polymer ratio indicating no loss of the drug after spray-drying.

Graphic of concentration of Hibp released from the material in function of the time shows that the drug is mainly released in the first 100 min reaching a constant maximum of about 7.0 x 10^{-3} g L^{-1} after that. The profile obtained for this *in vitro* drug release assay is compatible with those described in the literature for other systems and the peak of concentration is near to that of the minimum concentration range of therapeutic efficacy for Hibp [2,3].

Acknowledgments: FAPESP, CNPq. Dr. Ricardo A. Alves de Couto for helping on HPLC experiments.

References

[1] A. C. Pio Santos, D. T. de Oliveira, C. R. Gordijo, D. de Oliveira Silva. “Spray-dried encapsulation of the anti-inflammatory drug ibuprofen into cellulose acetate”. In: / VII Encontro da SBPMat/ 7th Brazilian MRS Meeting, Guarujá, São Paulo, 2008.
[2] A.E. Steen, P.W. Reeh, G. Geisslinger, K. H. Steen. Eur. J. of Pain. 4, 2 (2000) 209.
[3] W. Holubek, A. Stolbach, S. Nurok, O. Lopez, A. Wetter, L. Nelson. J. of Med. Toxic. 3, 2 (2007) 52.