

Nanostructured Lipid Carriers containing natural lipids for cosmetic application on the skin

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Abstract

Nanostructured Lipid Carriers (NLCs) are systems of great importance, used as drug carriers for medicine and cosmetic purposes, capable of modulating the liberation of the actives and protecting unstable compounds. This work consisted in preparing NLCs composed of a natural butter (melting point 35°C), an animal wax (melting point 38°C) and a liquid vegetable oil (boiling point ~ 150 melting point 38°C). The NLCs were prepared by high pressure homogenization method and characterized. The effects of the oil content between 2 and 40%, homogenization pressure (400 – 800 bar) and number of homogenization cycles were evaluated. Melting points of the NLCs were determined by Differential Scanning Calorimetry (DSC). Formulations stability at room temperature was evaluated for 68 days. Stable NLC formulations with average particle size (Z_{ave}) ranging between 150 and 200 nm, polydispersity index (PDI) less than 0,2 and zeta potential (ZP) between -25 and -40 mV were obtained. Melting point of the lyophilized samples was found to be between 40 and 56°C. The pH obtained for the formulation containing 10% liquid lipid ranged from 5,0 to 5,2 at room temperature and 5,0 to 5,5 at 4°C, which indicate good chemical stability at both conditions. The NLCs obtained were presented as potential cosmetic agents.

Key words: nanostructured lipid carriers, natural lipids, vegetable oil.

Introduction

Nanostructured Lipid Carriers (NLCs) are a second generation of lipid nanoparticles and are composed by a mixture of solid and liquid lipids at room temperature¹. These systems have increased encapsulation efficiency of actives in their structure due to higher matrix disorganization. This work consists in preparing and characterizing NLCs composed by a vegetable butter and an animal wax, in association with a vegetable oil.

Results and Discussion

We obtained NLCs with Z_{ave} ranging from 150 to 210 nm and PDI lower than 0,2, which indicate monodisperse suspensions, and ZP ranging between -20 and -40 mV, indicating stability due to electrostatic repulsion. It was found that using more than three cycles of high pressure homogenization causes no significant changes regarding Z_{ave} , PDI and ZP. The DSC results showed that the melting points of the CLNs ranged from 40 to 56°C, so the application of the formulations to the skin may be feasible. The pH of the formulation containing 10% liquid lipid ranged from 4,6 to 5,0 at room temperature and from 5,0 to 5,2 to 4°C, which indicate good chemical stability. Image 1 shows variation of Z_{ave} , PDI and ZP during 68 days of storage at room temperature. No significant changes in NLCs characteristics were observed, which indicate good stability of the systems during 68 days.

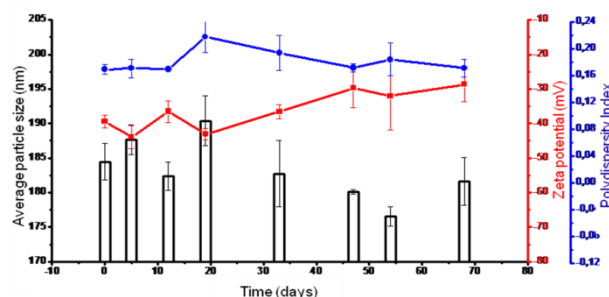


Image 1. Z_{ave} , PDI and ZP of the formulation produced at 600 bar, containing 10% of liquid lipid, after 3 cycles of homogenization.

Conclusions

We obtained and characterized NLCs containing natural moisturizing lipids, which showed good stability for 68 days and fusion temperature suitable for application of the skin.

Acknowledgement

This study received financial support from PIBIC-Unicamp, CPNq and CAPES. We thank Unicamp and Laboratório de Química Biológica for support.

¹ Fan, H.; Lui, G.; Huang, y.; Li, Y.; Xia, Q. *Appl. Surf. Sci.* **2014**, 288, 193.