



# Synthesis and Characterization of Chloroaluminium Phthalocyanine Incorporated in PLA/Gelatin Bionanocomposites for Photodynamic Therapy

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**Abstract.** Development delivery systems, such as nanoparticles, represent a growing area in biomedical research. Nanoparticles were prepared using a combination of two methods, the desolvation / emulsion technique using poly (lactic acid) (PLA) and gelatin (nPLA-G) forming a bionanocomposites which are hybrid materials composed of a biodegradable material and a nanodimensional material. Chloroaluminium phthalocyanine (CIAIPc) was chose as photosensitizer (PS). CIAIPc is a second generation of photosensitizer used in photodynamic therapy (PDT). CIAIPc loaded nanoparticles (nPLA-G/CIAIPc) were prepared using the same process. The PLA-gelatin nanoparticles were successfully prepared by the combination of desolvation / emulsion technique. The nanoparticles presented uniform size and spherical shape. The mean nanoparticle size was  $655.1 \pm 202.8$  nm for nPLA-G (PDI = 0.163) and  $772.2 \pm 239.4$  nm for nPLA-G/CIAIPc (PDI = 0.134). The zeta potential for nPLA-G and nPLA-G/CIAIPc revealed an average value of  $+ 10.0 \pm 3.15$  mV and  $+ 15.9 \pm 3.29$  mV, respectively. CIAIPc loaded nanoparticles maintain its photophysical behavior after encapsulation. The encapsulation efficiency was of  $90.89 \pm 7.55\%$ . All the physical–chemical and photophysical measurements performed allow us to reinforce the idea of a new nanoparticle, composed of PLA and gelatin, as drug delivery systems for PDT.

**Keywords:** poly (lactic acid) · gelatin · nanoparticles · bionanocomposites · photodynamic therapy

## 1 Introduction

Cancer is a major public health problem worldwide. The Brazilian National Cancer Institute (INCA) estimated 704,080 new cases in each year of the 2023–2025 triennium [1]. Cancer is a very complicated sequence of disease conditions progressing gradually with a generalized loss of growth control. There were only a few options of cancer treatment for patients for many decades such as surgery, chemo-therapy, and radiation therapy [2].

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