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# Polyvinyl butyral DMN-conjugates for the controlled release of singlet oxygen in medical and antimicrobial applications

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**Abstract.** Covalent attachment of 1, 4-dimethylnaphthalene (DMN) based endoperoxide forming subunits to a polyvinyl butyral (PVB) backbone has been achieved. The functionalized polymer materials prepared and characterized here can serve as biocompatible carrier systems for studying cellular uptake, intermediate storage and delayed release of singlet oxygen, which opens up new doors for optimizing a variety of medical applications of photogenerated DMN-endoperoxides such as antiviral, antibacterial, antiplasmodial and antitumor activity.

**Keywords:** dimethyl naphthalene; polyvinyl butyral; endoperoxides; singlet oxygen; drug carriers

## 1. Introduction

Strategies for the specific targeting and release of biologically active compounds play an important role in the fields of pharmacokinetics and drug design. In this context, the development of polymer-based carrier systems bears an enormous potential for future chemotherapy and nano-medicine (Duncan 2006, Wang *et al.* 2014). Since the pioneering studies on pharmacologically active polymers (Ringsdorf 1975), there has been a continuous improvement of covalently and non-covalently bound carrier-drug conjugates (Khandare and Minko 2006, Larson and Ghandehari 2012). Although in the mean time many of such polymer-drug conjugates have already progressed into clinical development, in some cases their non-biodegradable nature may still be considered as an important drawback. It is therefore important to keep on searching for alternative biocompatible drug delivery systems.

We have recently presented a novel strategy for controlling the delayed release of singlet oxygen ($^1O_2$) in the context of different biomedical applications including cancer chemotherapy or the deactivation of bacteria, viruses and parasites (Posavec *et al.* 2012). The singlet oxygen releasing system applied is based on the intermediate storage and transport of metastable endoperoxides photochemically generated from functionalized dimethylnaphthalene derivatives

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Step 2: 187 mg of PVB-SA was dissolved in 5 ml of dichloromethane, to which DCC (158 mg, 0.767 mmol), DMAP (6.25 mg, 0.0511 mmol), and finally, the DMN-OH derivative (104.5 mg, 0.767 mmol) were added. The mixture was vigorously stirred at RT for 72 h. Hexane was added until white DCC-urea precipitated. The solution was filtrated and hexane evaporated until a white oily product (PVB-SA-DMN) remained. Product characterization was performed with $^{1}$H NMR, FTIR and UV absorption spectroscopy.

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