# Phosphorylated alginate – Synthesis, Characterization, Influence on Blood Coagulation Processes

**Zdzisława Mrozińska[a], Michał B. Ponczek[b], Anna Kaczmarek[a], Paweł Urbaniak[c], Małgorzata Giełdowska[a], Natalia Festinger[a], Jerzy Chruściel[a], Magdalena Olak-Kucharczyk[a], Marcin H. Kudzin[a*]**

[a] Łukasiewicz Research Network— Lodz Institute of Technology, 19/27 Marii Sklodowskiej-Curie Str, Lodz, 90-570, Poland

[b] Department of General Biochemistry, Faculty of Biology and Environmental Protection, University of Lodz, Lodz, 90-236, Poland

[c] Faculty of Chemistry, University of Lodz, Tamka 12, Lodz, 90-236, Poland

## Abstract

Alginate have gained significant attention in the medical and pharmaceutical industry for their biochemical properties. The purpose of this study was to synthesis of phosphorylated alginate and determinate its impact on the Blood Coagulation Processes. Phosphorylation of alginate was achieved using a Phosphorus trichloride and Phosphorus (V) oxychloride (Figure 1.).

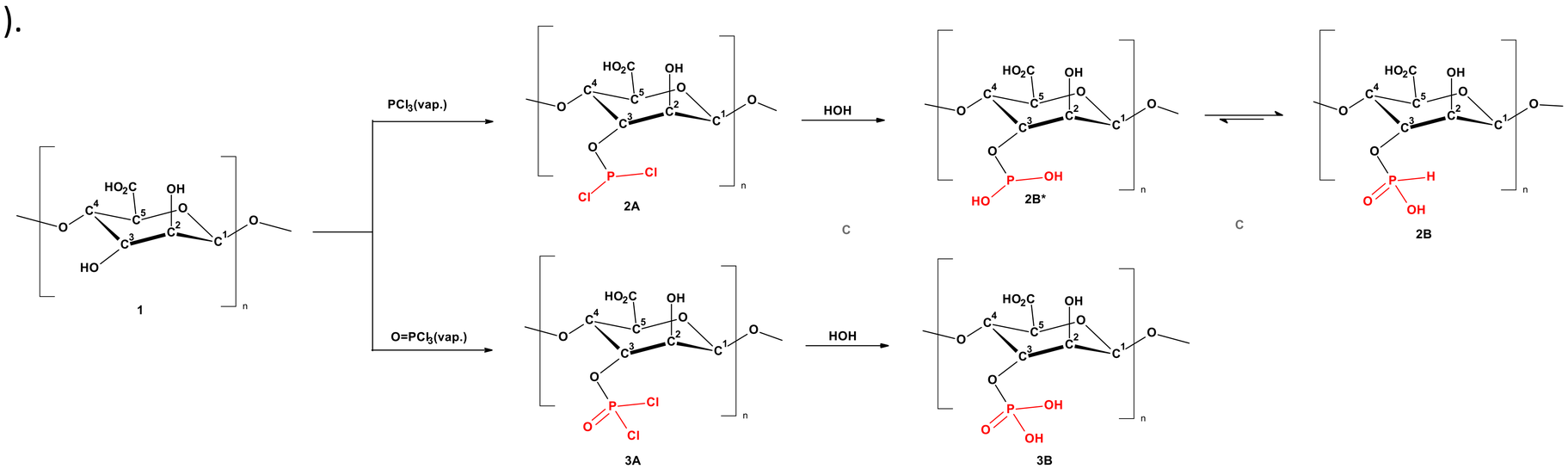


**Figure 1.** Vapor phosphorylation of alginate sodium salt with $PCl_3$ and $POCl_3$.

The degree of phosphorylation and characterization of phosphorylated polysaccharide were investigated by nuclear magnetic resonance spectroscopy (NMR), Fourier-transform infrared spectroscopy (FTIR), inductively coupled plasma – mass spectrometry (ICP-MS), specific surface area (Brunauer–Emmett–Teller method) and scanning electron microscopy/energy-dispersive X-ray spectroscopy (SEM/EDS). Influence of phosphorylated alginate on blood coagulation processes were evaluated by the biochemical-hematological tests including evaluation of Activated Partial Thromboplastin Time (PTT), Prothrombin Time (PT), and Thrombin Time (TT).

The surface modification of alginate sodium salt was successfully carried out by phosphorylation in vapour phase with $PCl_3$ and $POCl_3$.

unmodified | After 24h | After 48h

**$POCl_3$**

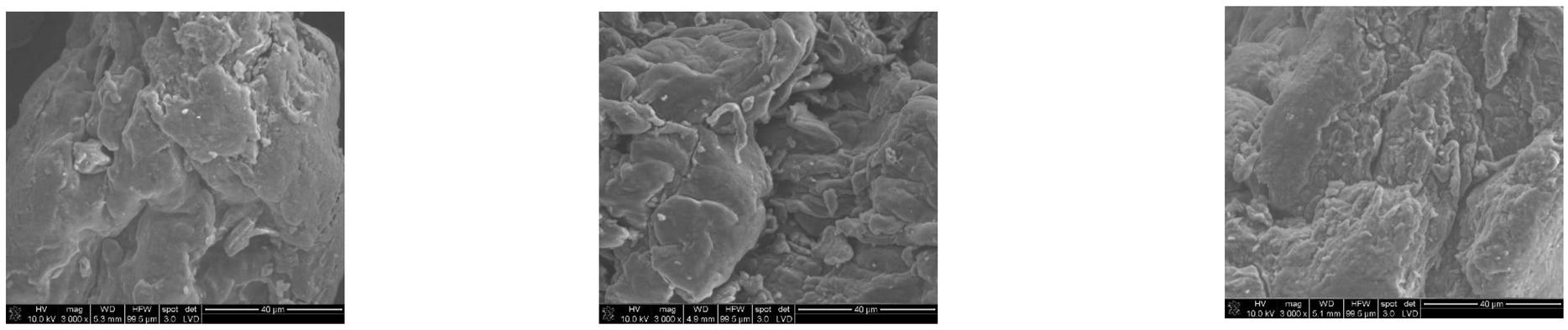

**Figure 2.** SEM images (x3000) of unmodified sodium alginate; phosphorylated sodium alginate by $PCl_3$ after 24h and 48h reaction time.

**$POCl_3$**

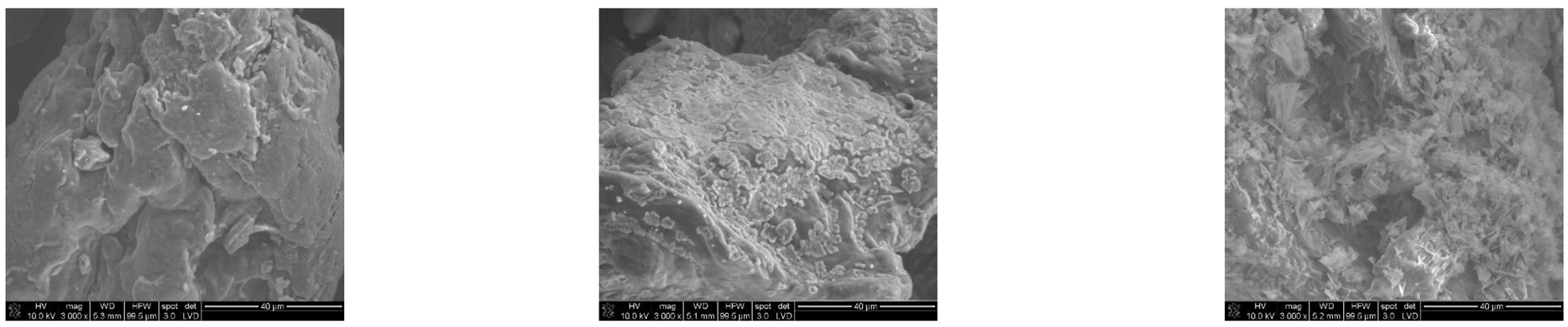

**Figure 3.** SEM images (x3000) of unmodified sodium alginate; phosphorylated sodium alginate by $POCl_3$ after 24hand 48h reaction time.

## Conclusions

The results of biochemical properties showed that the obtained phosphorylated alginates were promising materials to be used in biomedical applications.

www.lit.lukasiewicz.gov.pl

The 9th International Electronic Conference on Medicinal Chemistry
01–30 November 2023 | Online
MDPI