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Potato and cassava starches modified by green technology ozonation to improve processability in additive manufacturing; production of potential bone scaffolds

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The additive manufacturing of bone scaffolds from this modified polysaccharide is innovative, combining sustainable approaches with its well-known biocompatibility and better processability [1,2]. Ozonation, a green technology, improves the functionality of native starches through chemical and structural modifications [3]. Against this backdrop, this study sought to assess the potential for applying ozonation to potato and cassava starches to improve 3D printing processability and final properties of potential bone scaffolds. The starches were modified by ozonation (30 min, 10 % m/m, 50.8 g/m^3 O_3 (g)) and characterized by SEM, XRD, and FTIR-ATR. The hydrogels based on the native and modified starches (10% w/w, d.b.) were evaluated in rheology and printability (ImageJ analysis). The scaffolds were printed (3D extrusion printing BioedPrinterV4, BioEdTech - Brazil), freeze-dried and its mechanical properties (compression tests by texturometer) were characterized. The results showed that the ozone-modified potato and cassava starches showed no change in morphology, a reduction in relative crystallinity, and FTIR bands corresponding to oxidation signals. The hydrogels based on the modified starches showed a predominantly elastic rheological character which resulted in inks with better printability. In addition, the bone scaffolds based on the modified starches had a higher compressive strength. Finally, it was noted that potato starch had greater potential for application in 3D printing than cassava starch. In addition, this work shows that the process of modifying starch by ozonation is an interesting alternative for functionalizing these biopolymers, improving their potential for use in bone tissue engineering.

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References:

[1] Naseri, E. et al. Macromol Biosci 21, 1 (2021).
[2] Lima, D. C. et al. Food Hydrocoll 108, 2 (2020).
[3] Maniglia, B. C. et al. Int J Biol Macromol 138, 1087 (2019).