Process for obtaining functionalized chitosan with dihydroxyfumaric acid

Maria GONTA*, Iacob GUTU, Gheorghe DUCA, Mihai CEACIRU

Moldova State University, mvgonta@yahoo.com

Introduction

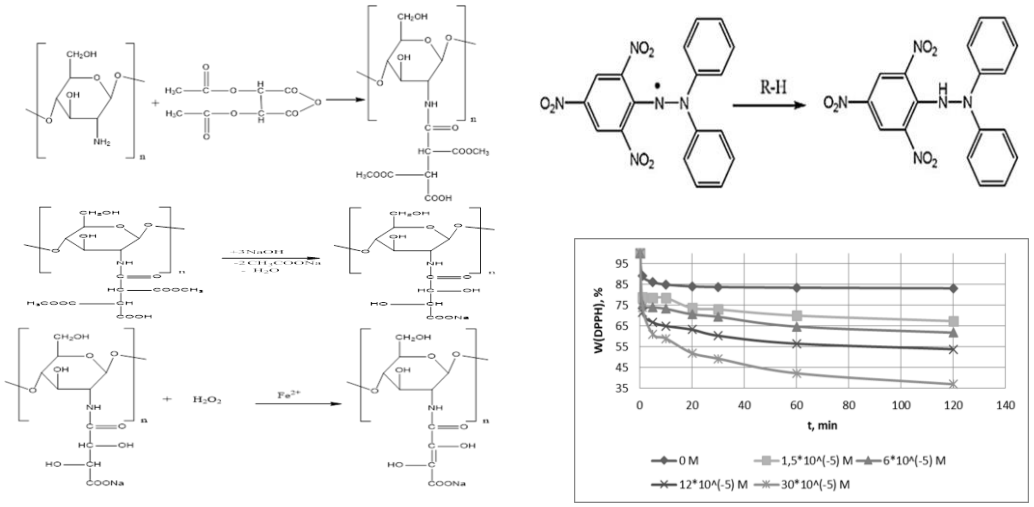
Natural antioxidants, such as dihydroxyfumaric acid, have attracted considerable interest due to their reducing properties and effects. Free radicals and reactive oxygen species are involved in the appearance of different types of oxidative damage to biomolecules. As a result, these risk factors have led to the development of various pathologies in human organisms. Free radicals can induce changes in various biological tissues and cells of biomolecules such as lipids, proteins, DNA or RNA.

Motivation and Description of Work

The main role of antioxidants is to reduce the risk of developing various pathologies in the human body. Many synthetic antioxidants have been used in the food, medicine, pharmaceutical industries, but recent research has mentioned the disadvantages and possible toxic properties of human and animal health.

Antioxidants can be used to inhibit the formation of N-nitrosocompounds, which are potential carcinogens due to their ability to alkylate DNA molecules. Reducing human exposure to endogenously formed NNAs, as a way to prevent cancer, is possible by using inhibitors (antioxidants) in nitrosation processes that can occur with the use of various medicinal products (antibiotics, anti-inflammatory drugs, diuretics etc.).

Results



Mechanisms of interaction of DPPH with reducing agents and formation of copolymer CH : DFH_2Na

The invention relates to the synthesis of a copolymer obtained after functionalization of chitosan (Cht) with carboxylic acids (dihydroxyfumaric acid), which is obtained from tartaric acid, a by-product of the wine industry. A new process includes: N-acylation of Cht with diacetyl tartaric anhydride and the formation of chitosan with diacetyltartaric acid residues (Cht-ADAT); alkaline hydrolysis of Cht-ADAT was performed and functionalized chitosan with residues of tartaric acid (Cht-AT) obtained; oxidation of the composite Cht-AT with the Fenton reagent to obtain the copolymer Cht-DFH_2Na. The socio-economic importance is determined by the fact that carboxylic acids are obtained from tartaric acid, which is a by-product of the wine industry.

Conclusion

In the proposed process the reactions are carried out in liquid phase which leads to an increase in the yield of the reaction. The formed product, chitosan with dihydroxyfumaric acid, shows antioxidant properties. Cheap reagents (tartaric acid, sodium hydroxide and hydrogen peroxide) are used and a high reaction yield product is obtained..

It was found that the concentration of DPPH consumed over time for DFH_2Na is lower compared to the consumption of DPPH for CH: DFH_2Na. Thus we find that the CH: DFH_2Na copolymer is about 2.5 times more active than DFH_4

References

[1]Shanta, P.; Paras, N. Y. *Functionalization of chitosan polymer and their applications*. J. of Macr. Science, 2019, 56, pp. 1-26.

[2] Schreiber, SB.; Bozell, JJ.; Hayes, DG.; Zivanovic, S. *Introduction of primary antioxidant activity to chitosan for application as a multifunctional food packaging material*, Food Hydrocolloids, 2013, 33, pp. 207-214.