

References

1. Gibas E. Polyethylene films - raw materials and necessary additives. *Plas Proc* (in Polish) 2014; 3: 224-232.
2. Richert A. Bacteriostatic properties of polyethylene composites. *Chem Ind* (in Polish) 2017; 96 (7): 1528-1530.
3. Scannell AGM, Hill C, Ross RP, Marx S, Hartmeier W, Arendt EK. Development of bioactive food packaging materials using immobilised bacteriocins Lacticin 3147 and Nisaplin®. *Int J Food Microbiol* 2000; 60: 241–249.
4. Walczak M, Richert A, Burkowska-But A. The effect of polyhexamethylene guanidine hydrochloride (PHMG) derivatives introduced into polylactide (PLA) on the activity of bacterial enzymes. *J Ind Microbiol Biotechnol* 2014; 41:1719–1724.
5. Ramamurthy P, Chellamani KP, Dhurai B, Rajan SPT, Subramanian B, Santhini E. Antimicrobial characteristics of pulsed laser deposited metal oxides on polypropylene hydroentangled nonwovens for medical textiles. *FIBRES & TEXTILES in Eastern Europe* 2017; 25, 2(122): 112-119. DOI: 10.5604/12303666.1228192
6. Tawiah B, Badoe W, Fu S. Advances in the Development of Antimicrobial Agents for Textiles: The Quest for Natural Products. Review. *FIBRES & TEXTILES in Eastern Europe* 2016; 24, 3(117): 136-149. DOI: 10.5604/12303666.1196624
7. Lucas AD. Environmental fate of polyhexamethylene biguanide. *Bull Environ Contam Toxicol* 2012; 88: 322–325.
8. Pinto F, Maillard JY, Denyer SP, McGeechan PM. Polyhexamethylene biguanide exposure leads to viral aggregation. *J Appl Microbiol* 2010; 108: 1880–1888.
9. Curd FHS, Hendry H, Kenny TS, Murray AG, Rose FL. Synthetic antimalarials. Part XXVIII. An alternative route to N1-aryl-N5-alkyldiguanides. *J Chem Soc* 1948; 1630-1636.
10. Lysytsya AV. Research on the impact of polyhexamethyleneguanidine on the plant component of biocenoses. *Biosyst Divers* 2017; 25 (2): 89-95.
11. Byrde RJ, Clifford DR, Woodcock D. Fungicidal activity and chemical constitution XI*. The activity of n-alkyl guanidine acetates. *Ann Appl Biol* 1962; 50 (2): 189–377.
12. Broxton P, Woodcock PM, Heatley F, Gilbert P. Interaction of some polyhexamethylene biguanides and membrane phospholipids in *Escherichia coli*. *J Appl Bacteriol* 1984; 57: 115–124.
13. Allen MJ, White GF, Morby AP. The response of *Escherichia coli* to exposure to the biocide polyhexamethylene biguanide. *Microbiology* 2006; 152: 989–1000.
14. Brzezinska MS, Walczak M, Jankiewicz U, Pejchalová M. Antimicrobial activity of polyhexamethylene guanidine derivatives introduced into polycaprolactone. *J Polym Environ* 2017; <https://doi.org/10.1007/s10924-017-0974-9>
15. Lysytsya A, Lyco S, Portuhaj O. The polyhexamethyleneguanidine stimulation of seeds growing and cell proliferation. *Mater Sci Eng B* 2013; 3 (10): 653-660.
16. Kratzer C, Tobudic S, Graninger W, Buxbaum A, Georgopoulos A. In vitro antimicrobial activity of the novel polymeric guanidine Akacid plus. *J Hosp Infect* 2006; 63: 316–322.
17. Razzaghi-Abyaneh M, Shams-Ghahfarokhi M, Kawachi M, Eslamifar A, Schmidt OJ, Schmidt A, Allameh A, Yoshinari T. Ultrastructural evidences of growth inhibitory

- effects of a novel biocide. Akacid-plus on an aflatoxigenic *Aspergillus parasiticus*. *Toxicon* 2006; 48: 1075–1082.
18. Feng L, Wu F, Li J, Jiang Y, Duan X. Antifungal activities of polyhexamethylene biguanide and polyhexamethylene guanide against the citrus sour rot pathogen *Geotrichum citri-aurantii* in vitro and in vivo. *Postharvest Biol Technol* 2011; 61: 160–164.
 19. Mathurin YK, Koffi-Nevry R, Guéhi ST, Tano K, Oule´ MK. Antimicrobial activities of polyhexamethylene guanidine hydrochloride–based disinfectant against fungi isolated from cocoa beans and reference strains of bacteria. *J Food Prot* 2012; 75 (6): 1167–1171.
 20. Zhang Y, Jiang J, Chen Y. Synthesis and antimicrobial activity of polymeric guanidine and biguanidine salts. *Polymer* 1999; 40: 6189–6198.
 21. PL225392 B1- Process for the production of an aminobenzenesulfonic derivative of polyhexamethylene guanidine (in Polish).
 22. ISO 22196: 2007 (E): Plastics - Measurement of antibacterial activity on plastics surfaces.
 23. ASTM G21 - 96: Standard practice for determining resistance of synthetic polymeric materials to fungi. West Conshohocken, PA: American Society for Testing and Materials (ASTM);1996.
 24. Zhou Z, Wei D, Guan Y, Zheng A, Zhong J-J. Extensive in vitro activity of guanidine hydrochloride polymer analogs against antibiotics-resistant clinically isolated strains. *Mater Sci Eng C* 2011; 31: 1836–1843.
 25. Lewis K, Klibanov AM. Surpassing nature: rational design of sterile-surface materials. *Trends Biotechnol* 2005; 23 (7): 343-348.
 26. Rogalsky S, Bardeau J-F, Tarasyuk O, Fatyeyeva K. Fabrication of new antifungal polyamide-12 material. *Polym Int* 2012; 61 (5): 686–691.
 27. Kondratyuk TO, Bardeau J-F, Sobko VM, Tarasyuk OP, Makhno SM, Sheludko EV, Kyselov YuV, Rogalsky SP. Antifungal activity of polyamide 12 films modified with polyhexamethylene guanidine dodecylbenzenesulfonate. Poster session presented at: *Modern Problems of Surface Chemistry, International Conference*; 2014 May 19-23; Kyiv, Ukraine.