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Hybrid antimicrobial particles and the process for their production

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The invention relates to obtaining new hybrid antimicrobial particles with applications in environmental and health protection and the process for their production. In order to create quaternary ammonium-functionalized-kaolin microparticles with antimicrobial effect, we grafted the QAS on the surface of kaolinite microparticles by a three-step procedure: (i) the intercalation of dimethyl sulfoxide (DMSO) molecules in the kaolinite layer (K) in order to increase the interlayer space and to make it accessible for further organic chemical grafting; (ii) chemical modification of kaolin intercalated with DMSO (K-D) with a silane monomer containing vinyl groups vinyltrimethoxysilane (VTMS)/ vinyltriethoxysilane (VTES); and (iii) free-radical polymerization of a quaternary ammonium salts with vinylbenzyl-trimethylammonium chloride (VBTAC). Chemical indicators, chemical oxygen demand (COD) and total phosphorous (TP), associated with the disinfection process were lower with approximately 15% and 42%, respectively, after treatment with the functionalized microparticles (vs. the initial WW sample). Although, kaolin alone presented a good bactericidal activity against Gram-negative bacteria such as E. Coli, the bacteriological indicators of the quaternary ammonium-functionalized-kaolin microparticles have indicated that such materials particularly contribute to the reduction of coliforms, C. perfringens but also E coli O157 by 82%, 65% and 67% respectively [A.M. Gavrilă, A. Zaharia, L. Paruch, F.X. Perrin, A. Sarbu, A.G. Olaru^c, A.M. Paruch^c, T.V. Iordache^c, Molecularly imprinted films and quaternary ammonium-functionalized microparticles working in tandem against pathogenic bacteria in wastewaters, *Journal of Hazardous Materials* 399, 123026, 2020. <https://doi.org/10.1016/j.jhazmat.2020.123026>].

CHARACTERISTICS

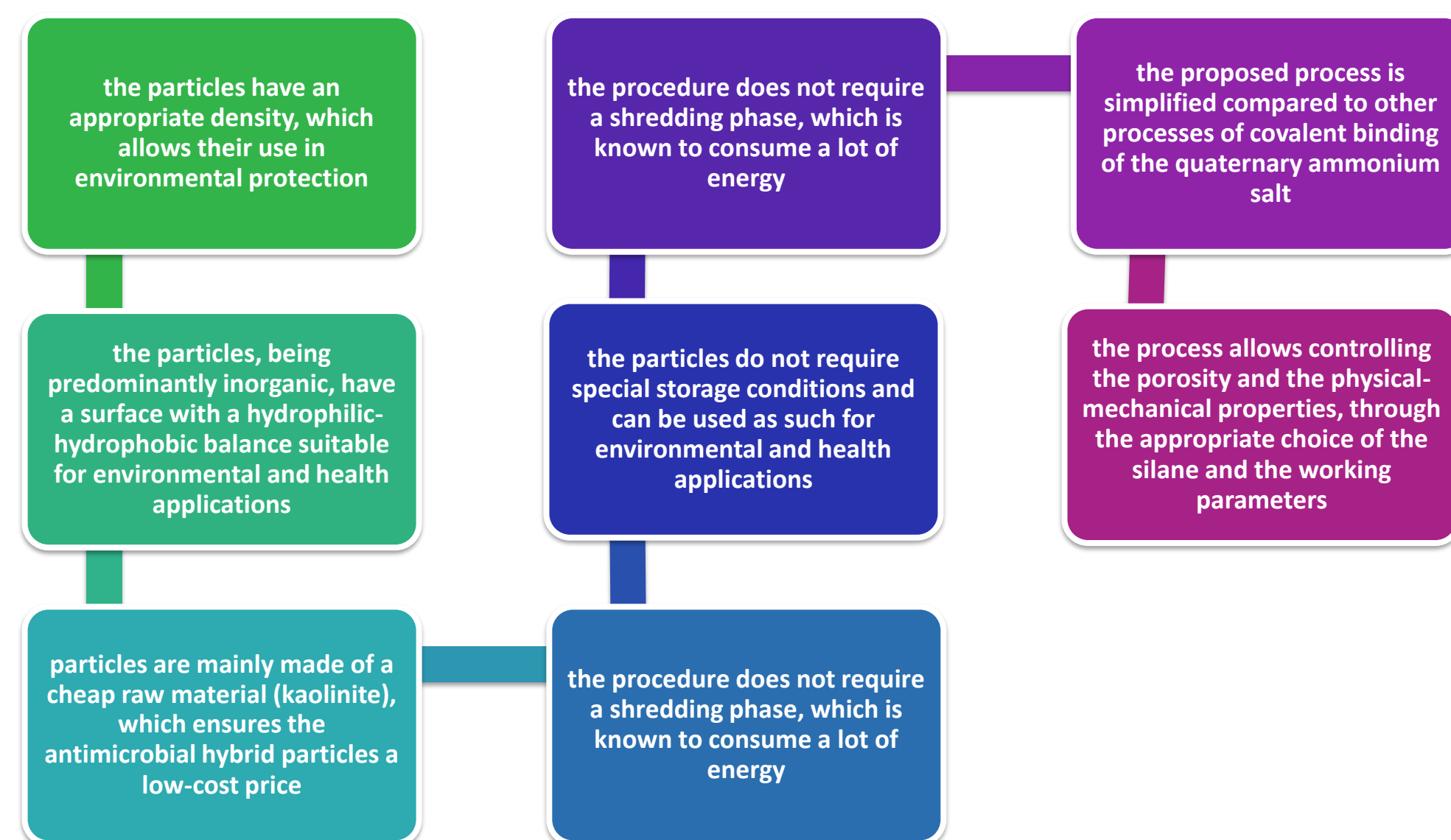
Chemical and bacteriological indicators evaluated after 24 h contact with WW, and the standard error of means (SE)

Indicator	WW reference*	K-QAS	K
chemical oxygen demand (COD ± SE), mg L ⁻¹	11275.0 ± 17.21	9549.0 ± 201.50	8751.7 ± 202.28
Total phosphorus (TP ± SE), mg L ⁻¹	57.70 ± 0.02	33.90 ± 1.44	31.20 ± 1.08
E coli O157 ± SE, CFU·100 mL ⁻¹	1.00 ± 0.00	0.33 ± 0.33	0.00 ± 0.00
Total Coliforms ± SE, CFU·100 mL ⁻¹	120.00 ± 0.03	26.33 ± 5.50	34.67 ± 6.33
C. perfringens ± SE, CFU·100 mL ⁻¹	82.00 ± 0.02	29.33 ± 3.48	57.67 ± 3.18

*the volume of wastewater was 100 mL/0.5 mg of microparticles

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ADVANTAGES OF THE PROPOSED INVENTION



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<https://icechim.ro/en/rd-groups/g1-advanced-polymer-materials-and-polymer-recycling/>

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