antimicrobial effect against selected bacterial strains in comparison with the natural diatomite (control) where any inhibitory potential was recorded. This phenomenon is related to the immobilization of silver ions to the diatomite support and formation of (AgCl, Ag)NPs/diatomite formulations, which consequently causes the inhibitory effect.

According to the literature data [10], the minimum inhibitory concentration of AgNPs/graphene oxide/diatomite composite against *E. coli* and *S. aureus* was found to be 5 and 10 mg/mL. A higher range (10.0–60.0 mg/mL) of antimicrobial effects has been shown for AgNPs/zeolite composites against *Streptococcus mutans*, *Lactobacillus casei*, *Candida albicans* and *Staphylococcus aureus* [17]. Another research group has presented the effect of nanosilver/diatomite composites in water treatment with a concentration of 5 mg/mL; the respective formulation inhibits almost 100% of *E. coli* cells [11]. In our research, the MIC values, based on the silver content in the hybrid composites, were found to be significantly lower in contrast to literature data (below 5 mg/mL). Moreover, the same inhibitory effect of (AgCl, Ag)NPs/diatomite formulations containing different concentrations of silver ions (4.65% and 7.21%) was observed. This does not exclude the fact that this phenomenon is related to the formation of different ratios between AgCl-NPs and AgNPs nanoparticles described in Section 3.2.1. The ratio of AgCl-NPs:AgNPs in composites is changed depending on the silver concentrations used in the composite synthesis. The AgNP content in the hybrid formulation increases with increasing silver concentrations. It is noteworthy that 4.65% (AgCl, Ag)NPs/diatomite contained a lower concentration of AgNPs than 7.21% (AgCl, Ag)NPs/diatomite formulations but showed the same inhibitory potential. This fact could indicate that AgCl-NPs have a greater inhibitory effect than AgNPs since (AgCl, Ag)NPs/diatomite formulations presented the same effect. This phenomenon can also be correlated with the Trojan horse action mechanism of (AgCl, Ag)NPs/diatomite composites, where the content of secondary oxidized silver ions on the surface of nanoparticles, e.g., AgCl-NPs/AgNPs, determines the antimicrobial effects [50]. The same phenomenon was noticed by [21] when tested Ag/mesoporous silica and AgCl/mesoporous silica composites exhibited similar antibacterial activity, but the concentration of AgCl/mesoporous silica nanocomposites being two times lower.

Table 3. Minimal inhibitory concentrations of (AgCl, Ag)NPs/diatomite composites.

Bacteria Stains	**Minimum Inhibitory Concentration (MIC) of (AgCl, Ag)NPs/Diatomite Composite [mg/mL]**			
	Natural Diatomite	**0.71% Ag/Diatomite**	**4.65% Ag/Diatomite**	**7.21% Ag/Diatomite**
Staphylococcus aureus	-	5 (0.036 Ag mg/mL)	2.5 (0.116 Ag mg/mL)	2.5 (0.180 Ag mg/mL)
Klebsiella pneumoniae	-	10 (0.071 Ag mg/mL)	5 (0.232 Ag mg/mL)	5 (0.360 Ag mg/mL)

4. Conclusions

A method of synthesis of novel hybrid (AgCl, Ag)NPs/diatomite composites based on natural diatomite with a mineral impurity of halite was developed. A precursor of silver nanoparticles, silver nitrate solution, was used in different concentrations. One part of silver ions is converted into nanoparticles of silver chloride due to the exchange reaction of the silver nitrate solution with halite, while the other part of the silver ions is transformed into nanoparticles of metallic silver by means of a hydrogen peroxide agent. The presence of metallic silver nanoparticles and silver chloride nanoparticles in the synthesized composite is confirmed by X-ray structural analysis. The TEM analysis showed that the silver nanoparticles are uniformly distributed on the surface of the mineral matrix, and their sizes range from 1 nm to 10 nm with predominant sizes from 3 nm to 6 nm. Synthesized hybrid (AgCl, Ag)NPs/diatomite composites exhibit high antibiotic activity against Gram-positive and Gram-negative bacteria, indicating the prospect of their biomedical use as an