PREPARING NANO ZnO WITH Zn RECOVERED FROM WASTE WATER AND USE IN ANTIBACTERIAL AIR FILTER PRODUCTION

Eylül Büşra Tapanyiğit[1], Ali Haydar Ay[1],Mehmet Özdemir[1], Bilgehan Güzel[2]

1.Şampiyon Filtre Pazarlama Sanayi ve Ticaret A.Ş. İskenderun/TURKEY

E-mail: eylultapanyigit@sampiyonfilter.com.tr

2.Chemistry Department, Art and Science Faculty, University of Çukurova, Adana, TURKEY

ABSTRACT

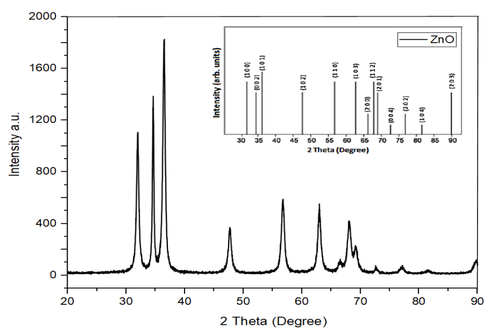
Cabin filters are used in order to remove the factors that negatively affect human health by keeping the dust, odor and pollen coming from outside into the interior of the vehicles. The literature shows that during the use of these filters, the filter surface and activated carbon used for odor retention create suitable environments for the formation of bacteria and fungi, and adversely affect the health of the passengers in the vehicle cabin with the operation of the ventilation system. Galvanization process is carried out in order to protect the metallic evenings used in production against corrosion in our enterprise, and after this process, zinc waste that creates environmental pollution is formed. In this study, zinc in galvanized wastewater was recovered by magnetic nanoparticles (MNP) and converted into ZnO particles. Antibacterial activities were investigated after application to filter paper.

METHODS

In the studies carried out within the scope of our project, the zinc in the galvanized wastewater was captured with the help of a magnetic nanoparticle (MNP). Afterwards, MNP-Zn was washed and non-metal impurities were removed. The cleaned MNP-Zn was treated with CH_3COOH and the zinc on the MNP was transferred to the solution in the form of zinc acetate salt. The zinc acetate solution was diluted to a concentration of 0.5 M and the same volume of 0.05 M urea was added dropwise. Then, NH_3 was added until the pH reached 9 and left to rest for 3 hours at 150°C in the oven. At the end of the period, the precipitated nano zinc oxide was removed by centrifugation and a 5% suspension was prepared and sprayed on the air filter.

RESULTS & DISCUSSION

- As a result of the studies, it has been observed that the zinc in the galvanized wastewater is successfully retained with the help of magnetic nanoparticles (MNP).
- The ZnO XRD diffraction patterns were found to be consistent with the catalogue.
- The data show that particle sizes range from 8 to 32 nm, with an average particle size of 17 nm.
- Antimicrobial activities were tested using gram negative and gram positive bacteria.
- At the end of the incubation, the total colonies grown in three petri dishes in the control samples and the samples containing ZnO were counted and averaged and evaluated as % effect.



2 Theta	Tanecikler arası Mesafe (d) (nm)	Tanecik boyutu (nm)
31,999	0,285	19,8
34,592	0,077	32,2
36,448	0,132	18,0
47,668	0,080	15,6
56,733	0,96	16,2
62,911	2,56	16,1
66,34	0,078	8,3
68,055	0,150	14,6
69,05	2,081	12,0
72,59	0,078	22,8
77,03	0,106	12,2
81,42	0,592	13,8

Figure 1. ZnO XRD diffraction pattern and particle size distribution

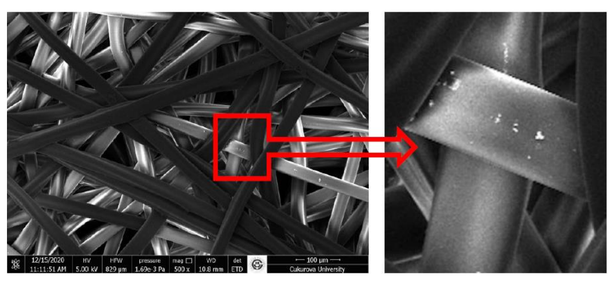


Figure 2. SEM image with ZnO on filter paper

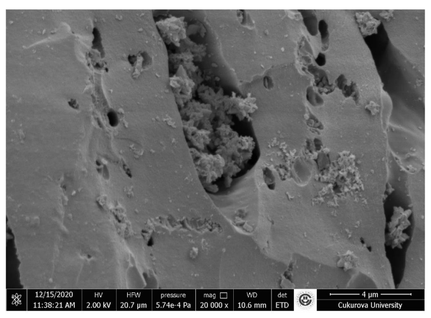


Figure 3. SEM image of nano ZnO's on activated carbon

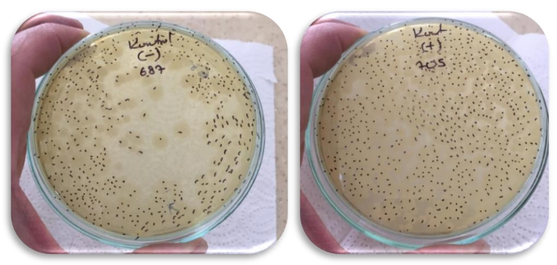


Figure 4. Gram (+) and gram (-) bacteria-free control trial

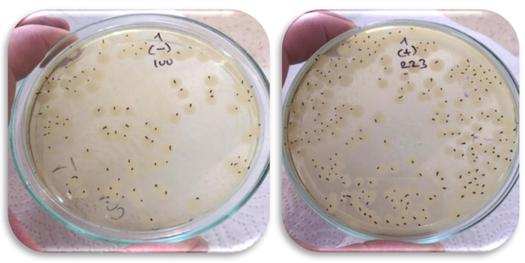


Figure 5. Effect of ZnO on bacterial growth

CONCLUSION

The obtained nano ZnO XRD diffraction patterns were found to be compatible with the catalog. 2 Theta data show that the particle sizes are between 8 and 32 nm and the average particle size is 17 nm. In the antimicrobial effect analysis were used for three for Bacillus and the other three for Pseudomonas aeruginosa test bacteria. When compared with the control sample, it was determined that the prepared ZnO was 85.44% effective against gram (-) bacteria and 68% against gram (+) bacteria.

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