



Method

Agar media was combined with distilled water to create nutrient agar. Agar medium and 10 mm paper discs used for wicks were autoclave sterilised before cooling in laminar air flow. A 50 mL fresh bacterial culture was used to inoculate the agar medium. Sterilised discs were then poured with synthesised nanocomposite and spread out in petri plates with a positive control in the middle. The petri dishes for 24 hours at 37 °C. Zone readers were used to measure the zones. A test was conducted using both bacterial strains. anti-fungal properties With a small adjustment, the antifungal activity was carried out in accordance with Devi [10]. The agar well diffusion experiment was used to assess the antifungal activity of the synthesised ZnO-SiO₂ nanocomposite in acetonitrile solvent. At 4 degrees Celsius, Sabouraud Dextrose Agar (SDA) slants were prepared and kept as stock cultures of *Candida parapsilosis* and *Aspergillus niger*. Nystatin was used as a positive control medication in parallel. We looked for signs of the zone of inhibition, which is the region around the walls, on the plates. Using a metre ruler, the diameter of these zones of inhibition was determined. The trials were carried out in triplicates, and the mean value was computed.

Results

FT-IR stands for Fourier Transform Infrared Spectroscopy. The ZnO-SiO₂ nanocomposite's FT-IR spectrum is displayed in (Figure 1). The stretching and bending vibrations of the OH group in the H₂O molecule are responsible for the broad absorption band at 3000–3600 cm⁻¹ and the peak at 1591 cm⁻¹, respectively. 0.1 M ZnO-SiO₂ Nano composite FT-IR spectrums. TGA, or thermogravimetric analysis For the ZnO-SiO₂ nanocomposite illustrated in Figure 1, the TGA-DSC curve depicts weight loss of the sample as a function of temperature. The four significant weight decreases were very visible. At 100 °C, there is a 6% weight loss in the first stage as a result of the elimination of physically adsorbed water molecules. The elimination of carbon monoxide from tartaric acid at 300°C is shown by the second curve, which shows a weight loss of 9%. The third significant weight drop of 12% was caused by the removal of two water molecules, which clarified how zinc tartrate was converted into ZnO. The temperature above which the vicinal hydroxyl group of silica were entirely condensed was revealed by weight loss at 700°C.

DLS Characterization

An important tool for determining the size of nanoparticles

in solution is dynamic light scattering (DLS). By examining the modulation of the scattered light intensity as a function of time, DLS analyses the light scattered from a laser that passes through a colloidal solution in order to estimate the hydrodynamic size of the particles and particle cumulation.

Conclusion

The goal of the current study was to use the deposition precipitation method to create a ZnO-SiO₂ nanocomposite in an acetonitrile solvent. In order to confirm the size and shape of the produced nanocomposite, various characterizations were done. ZnO-SiO₂ nanocomposite shown superior antibacterial activity against *Bacillus subtilis* when compared to *E. coli* and superior antifungal activity when compared to *Candida parapsilosis* when compared to *Aspergillus niger*. The antibacterial activity of methanol solvent was higher than the antifungal activity.

Acknowledgement

The authors would like to express their gratitude to the Higher Education Commission of Islamabad for providing the funding necessary to carry out this research.

References

- 1.