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NEW ROUTE FOR ECO FRIENDLY SYNTHESIS AND CHARACTERISATION OF CUO NANO PARTICLES BY USING PLANT SEED EXTRACT (JUJUBE SEEDS)

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ABSTRACT
The application of nanotechnology can be very beneficial in Recent trends of Material Science. The present method is a development of new methods of synthesizing Copper bi NPs that use environmentally safe reagents and solvents. This work reports a green method where copper nanoparticles were synthesized using Copper chloride and the aqueous extract of jujube seed extract as the reductant and starch as capping agent. The optimized conditions for the NPs synthesis were a temperature of 30°C, pH 7, 0.001M Cucl $_2$ 250 g/L seed extract. CuO NPs were characterized by Ultraviolet-Visible (UV-Vis) spectroscopy exhibiting a λmax at 324.75 nm, which was consistent within the wavelength range of 300–450 nm.

Synthesis of CuO NPs
The seeds of jujube fruit are powdered and weighed about25gm, add 100 mL of distilled water, and immersed the mixture in a water bath heated to 60 °C for 1 h. The green extract can be processed in a burette and used as a reducing agent. The extract was kept at 4 °C for further studies.

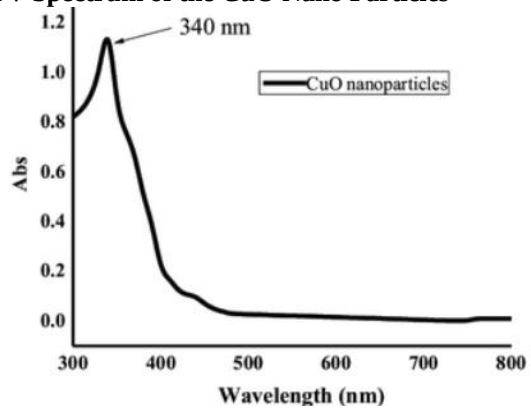
CuO nanoparticles are synthesized by chemical reduction method by using copper (II) sulphate pentahydrate as precursor or salt and starch as capping agent. A calculated amount of starch (1.2 g) is dissolved in 120 ml of double distilled water under the vigorous stirring for 2 hr. Then 0.1 mol of copper (II) sulphate Penta hydrate as a precursor salt is added in 20 ml of water. Then the dissolved precursor solution is slowly added drop by drop into the dissolved starch solution with the constant stirring. Now, the colour of the solution becomes light blue. In the second step, 0.2 mol of Ascorbic acid is added into the prepared solution. While Ascorbic acid is added drop by drop, the colour of the solution turned into light green colour and this solution is stirred for 5 min. Simultaneously, 0.5 mol 250 g/L jujube seed extract (JJBSE), and a reactant ratio of 4:5 (CuSO4 to JJBSE) aqueous solution is slowly added with continuous stirring and the light green colour turned into orange colour. The prepared solution is heated at 60 °C for 1 hr and allowed to settle for 24 hr until brown colour precipitate is obtained. The solution was filtered and the precipitate was washed with deionized water and ethanol and dried at room temperature. The reaction scheme is as shown below:

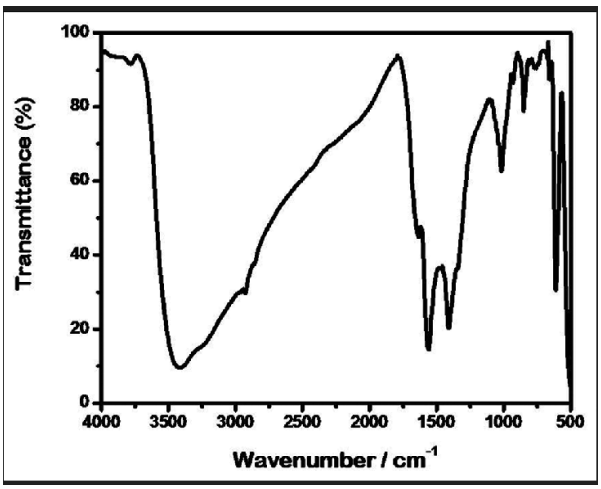
$$CuSO4 \cdot 5H2O + JJBSE \rightarrow xSO4 + Cu(OH)2 + 5H2O$$
$$Cu(OH)2 \rightarrow CuO + H2O$$


The key applications of copper oxide nanoparticles are as follows:

- Used as catalyst in rocket propellant.
- As ceramic resistors, magnetic storage media, gas sensors, near-infrared tilters, photoconductive and photothermal applications
- As semiconductors, solar energy transformation, and high-tech superconductors.

- **UV Spectrum of the CuO Nano Particles**





CONCLUSION

CuO nanoparticles have advantages because of its physical, chemical properties, its usage and manufacturing methods. The manufacture of this nano particles led to decrease in pollution and environmental hazardous. This paper exhibits the natural synthesis of Copper nano particles. CuO NPs were characterized by Ultraviolet-Visible (UV-Vis) spectroscopy exhibiting a λmax at 324.75 nm, which was consistent with the within the wavelength range of 300–450 nm.

The composition and modes of vibration of CuO nano particles were analysed by FTIR spectrometer (Perkin Elmer-50) in the range between 400 and 4000 cm−1. The obtained FTIR spectra are show confirms the formation of copper oxide nanoparticles with the ascorbic acid as a capping agent. The sharp peaks occurred at 513 cm−1 and 622 cm−1 indicate the presences of Cu–O stretching. The peak arising at 1019 cm−1 is due to Cu–(OH) stretching. Thepeaks that appeared from 3200 to 3500 cm−1 are attributed to OH− and C–O groups on the surface of the CuO nanoparticles.

Their spectra are also in coordination with the references.

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