Abstract Title	Photodegradation of Dyes and Pharmaceuticals for Wastewater Treatment Using Metal Ferrite Nanoparticles
Topic	Improving water quality
Challenges and Solutions	Due to water scarcity, there has been an uneven distribution and limited accessibility of fresh water. One of the causes behind this misfortune is caused by textile and pharmaceutical industries, because of the contaminants which cause a buildup of organic compounds in our water resources. This results in severe water pollution, imposing harmful effects to the environment (by destructing the biodiversity) and affecting human health (causing several diseases such as cholera, hepatitis A and dysentery) and also causing infant mortality. Low cost technologies such as the green method is favoured over traditional methods for wastewater treatment because it is non-polluting, environmentally friendly, non-toxic, consumes minimum amounts of materials and energy, and is easy to use.
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Abstract	Water is an essential element for domestic, industrial, and agricultural activities. However, there is a limited accessibility of fresh water due to contaminants which are being released by textile industries like dyes such as methylene blue (MB) and pharmaceuticals like antibiotics such as sulfisoxazole (SSX), which are being released in our water resources causing a build-up of organic compounds. Several methods have been used for wastewater treatment such as flocculation,

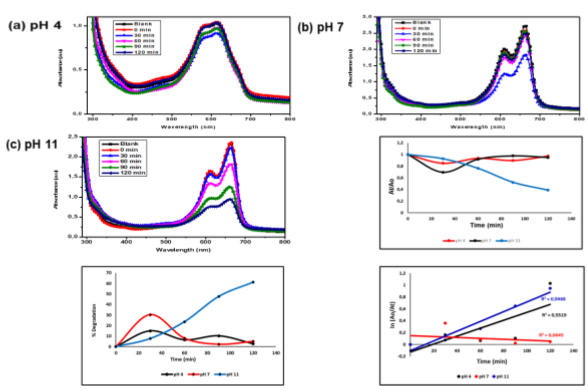
	adsorption, membrane filtration etc, however these methods result in high cost, inability to regenerate the material etc. In this study, we synthesized a bimetallic Zinc-nickel ferrite nanoparticles using *Commelina benghalensis* plant extract and testing it for the degradation of dyes and antibiotics in water. UV-vis, XRD, FTIR, BET, PL, VSM and TGA were used to characterize our metal ferrites. XRD showed that our material has a cubic face structure and through FTIR the phytochemicals were deposited on the metal ferrites. UV-vis is used to examine the material's formation and optical properties. the band gap was calculated using the extrapolation of a linear regression line on the plot's x-axis, yielding a band gap of 3.7 eV. Under BET the surface area of my material was found to be 3,67 m2/g, the metal ferrite is type 2, and the pore diameter was measured to be 28.47nm which makes it a mesoporous material. TGA determines the thermal stability of the material, where decomposition of the material is analyzed the derivative shows minimal loss at temperatures above 800^C confirming that the Zn-Ni ferrite nanoparticles were highly stable. the percentage degradation of methylene blue at pH 4 is 14.95%, at pH 7 is 30.38% and at pH 11 is 61.18%. it is observed that the rate of degradation of Methylene Blue under UV light improves from pH 4 to pH 11. The percentages increased from 14.95% to 61.18% at pH 11, therefore pH 11 was found to be the optimum pH in this study.
Figures/diagrams/illustrations	

Figure 1: (a,b,c) Photodegradation of MB by Zn-Ni ferrite at various pH values, (d) Plot of At/Ao vs time, (e) Plot of % degradation vs time, and (f) 1st order kinetics of In (Ao/At) vs time of MB by using Zn-Ni Ferrite catalyst.

The adsorption efficiency between the photocatalytic species and the dye pollutants is inhibited by pH, which plays an essential role in the breakdown of Methylene blue dye. The plots show the absorbance spectrum at different pH's. It can be shown from this data that the ferrite nanoparticles' strength increases as the pH rises. Under ultraviolet light, the rate of Methylene blue degradation improved considerably. From this analysis the percentage degradation of methylene blue at pH 4 is 14.95%, at pH 7 is 30.38% and at pH 11 is 61.18%. it is observed that the rate of degradation of Methylene Blue under UV light improves from pH 4 to pH 11. The percentages increased from 14.95% to 61.18% at pH 11, therefore pH 11 was found to be the optimum pH in this study.

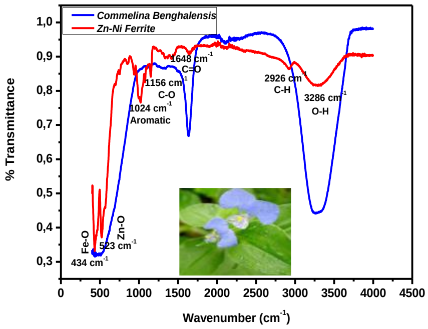


Figure 2: FTIR of Commelina benghalensis plant extract and Zn-Ni ferrite. The FTIR spectra of Commelina benghalensis plant and Zn-Ni ferrite nanoparticles are shown in the image. The presence of the hydroxyl group may be seen in the broad peak around 3000. C-H symmetry stretching is correlated with vibrations about 2850-2930. The structure of aromatic and carbonyl groups is shown by absorption peaks around 1000 and 1800, respectively. The metal ions Zn-O and Fe-O have absorption peaks in the 400-600 range, which is within the fingerprint region. The phytochemicals that were on the plants have been deposited on the ferrite material, according to the observations revealed by the FTIR spectra.