MICROWAVE-MEDIATED GREEN SYNTHESIS OF SILVER NANOPARTICLES BY USING VINCA ROSEA & ITS APPLICATION IN AIR POLLUTION CONTROL

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ABSTRACT

Silver nanoparticles were produced by using leaf extract of \textit{Vinca rosea}. The size of synthesized nanoparticles was between 50nm & 70nm. The size of synthesized silver nanoparticles was confirmed by using UV-VIS Spectroscopy & SEM. Application of silver nanoparticles for removal of sulphur dioxide from air pollution has been done & outcome obtained at 98% at its optimum.

Keywords: Vinca rosea, Silver Nanoparticles, SEM, Sulphur Dioxide.

Pollution” is the unwanted alteration in environmental parameters by means of mixing of certain objects, called as pollutants. Among all the kinds of pollution, water pollution is one, and has the deploying impacts over humans and atmosphere. Sulfur dioxide (SO\textsubscript{2}) is one of a group of highly reactive gases known as “oxides of sulfur.” The largest sources of SO\textsubscript{2} emissions are from fossil fuel combustion at power plants (73%) and other industrial facilities (20%). Smaller sources of SO\textsubscript{2} emissions include industrial processes such as extracting metal from ore, and the burning of high sulfur containing fuels by locomotives, large ships, and non-road equipment. SO\textsubscript{2} is linked with a number of adverse effects on the respiratory system. There are so many health problems which are considered as the impacts of exposure to SO\textsubscript{2}. Mostly, SO\textsubscript{2} evolution is the result of power generation, cement works, ceramic/brick production, waste incinerators, refineries, metal production and transport sectors. Thus, we can say that SO\textsubscript{2} evolution factors are too many in figures, and also show harmful effects on human in many ways. Some major impacts can be summarized as increased sensitivity for asthmatics and chronic bronchitis, malfunctioning of lungs, irritation of eyes, coughing, mucous secretion, and cardiac diseases. SO\textsubscript{2} also plays an important role in causing acid rain, which is estimated to damage the symbol of love, the “TAJ MAHAL”. In present study, the Silver nanoparticles were synthesized by using leaf extract of \textit{Vinca rosea} with reference of previously done studies such as by using leaf extract of \textit{Allium cepa} (Antariksh Saxena et.al., 2010), \textit{Terminalia catappa} (Balaprasad Ankamwar, 2010), \textit{Moringa oleifera} (Anamika Mubayi et.al., 2012), \textit{Ocimum sanctum} (Yogeswari Rout et.al., 2012), \textit{Panicum virgatum} (Cynthia Mason et.al., 2012), \textit{Pine} (Jae Yong Song et.al., 2009), \textit{Moringa oleifera} (M Shivashankar et.al., 2012), \textit{Camellia sinensis} ( Yuet Ying Loo et.al., 2012), \textit{Trianthema decandra} (R.Geethalakshmi et.al., 2010). The physical characterization of synthesized Silver nanoparticles was done by scanning electron microscope (SEM).
MATERIALS AND METHODS

Silver nano particles were synthesized by using leaf extract of *Vinca rosea*. In order to synthesize Silver nanoparticles, leaf extract was mixed with distilled water and 0.1N AgNO$_3$ solution was added. The mixture was introduced to a microwave oven at 360W for 25min. Synthesized nanoparticles were used to analyze their effect over different concentrations of SO$_2$ by preparing Sodium sulphite viz. effect of contact time, kinetic studies, Isotherm studies, effect of initial concentration and effect of temperature.

RESULT & DISCUSSION

The formation of Ag nanoparticles by using *Vinca rosea* is expected to occur by the process known as “reduction”. The chlorophyll a & chlorophyll b present in the leaf extracts of *Vinca rosea* reduce the Ag$^{++}$ provided in the medium by 0.1N AgNO$_3$ solution. The confirmation of synthesis of Silver nanoparticles was done by using UV-Vis spectrooscope & SEM. Concerning images are bestowed below:

Figure 1- UV-VIS spectrooscope image

Figure 2- SEM image of silver nanoparticles

The effect of contact time on percentage removal of SO$_2$ has been done and the obtained results are presented in graphical form as follows:

Figure 3 – Variation of Contact time
The graph clearly indicates that the removal of SO₂ from air reaches to its optimum of 98% by the 05th min of its introduction; this indicates high adsorbing efficiency of Silver nanoparticles. Likewise, effect of initial concentration on percentage removal of SO₂ suggests the 10ppm concentration as the optimum. Similarly, the effect of dosage on percentage removal of SO₂ has been done and it is found that 0.2gm amount of Silver nanoparticles is sufficient enough for 100ml of aqueous sample of SO₂. Effect of temperature on percentage removal of SO₂ gave the outcome as 40°C temperature is the optimum. Kinetic and isotherm studies suggest that removal of SO₂ follows Pseudo second order reaction and Freundlich isotherm respectively, results in form of graphs are given below in figure 4 & 5 respectively:

**Figure 4**

**Figure 5**

**OUTCOME OF WORK**

The Silver nanoparticles were found to remove SO₂ with great efficiency. The optimum removal in this concern was found to be 98%.

**REFERENCES**


