M. S. Latha et al., Madridge J Nanotechnol Nanosci. 2018
http://dx.doi.org/10.18689/2638-2075.a3.004

3rd International
Nanotechnology Conference & Expo
May 7-9, 2018 Rome, Italy

Nanoparticles for the Decontamination of Water

M. S. Latha[1]* and **P. Geetha**[2]
[1]Department of Chemistry, Sree Narayana College Chengannur, India
[2]Department of Chemistry, Devaswam Board College, India

Availability of pure water is very essential for sustaining life on earth. Disposal of toxic waste water without proper treatment to the environment, polluted natural water sources leading to scarcity of clean water across the world. Removal of pollutants from water is one approach to address the problem of water scarcity. Various biosorbents have been investigated for the purpose. We have synthesized nanoparticles of polysaccharides, alginate and cellulose for the removal of Dyes and heavy metals from water.

The potential of these nanoparticles for heavy metal and dye removal was studied by batch adsorption technique. The influence of various parameters on biosorption such as pH, initial concentration, contact time, biosorbent amount and temperature was also studied. Repeated adsorption on alginate could bring down the concentration of heavy metals and dyes to the range of potable water. Thermodynamic parameters confirmed the endothermic nature, spontaneity and irreversible nature of the biosorption process. The desorption studies using 0.2 M HCl showed the reusability of the sorbent.

Since alginate is known for its antimicrobial activity, the possibility of using it for the removal of microbes from contaminated water was evaluated by taking both gram negative (*E.coli*) and gram positive bacteria (*S.aureus*) as indicator organisms. Effect of alginate nanoparticles on cell wall integrity was studied by death rate assay. More than 80% of *E.coli* cells were killed after an incubation time of 120 minutes whereas only 65% of *S.aureus* cells were damaged showing the more sensitive nature of gram negative *E.coli* for alginate nanoparticles. SDS method showed the rapid reduction of cell wall integrity of gram negative *E.coli* strain after 30 minutes of incubation while only less than 40% and 70% loss for *S.aureus* after 60 and 90 minutes respectively. The result showed that the *S.aureus* cell wall is more resistant towards alginate. The SEM images of treated sample showed severe damage to the cell wall of *E.coli* while the effect was not so prominent in the case of gram positive *S.aureus*.

This study demonstrates the potential of using calciumalginate for the effective removal of toxic heavy metals, dyes and microorganisms from contaminated water. Since alginate is a cheap and easily available material, it could be developed as a promising material for the detoxification of waste water.