Form 2

THE PATENTS ACT 1970
(39 of 1970)

COMPLETE SPECIFICATION

SECTION 10

POLYURETHANE FOAM COATED WITH SILVER NANOPARTICLES

INDIAN INSTITUTE OF TECHNOLOGY IIT P.O. CHENNAI 600 036, TAMIL NADU, INDIA, AN AUTONOMOUS BODY SET UP BY THE GOVERNMENT OF INDIA UNDER AN ACT OF PARLIAMENT

THE FOLLOWING SPECIFICATION PARTICULARLY DESCRIBES THE NATURE OF THIS INVENTION AND THE MANNER IN WHICH IT IS TO BE PERFORMED:

This invention relates to polyurethane foam coated with silver nanoparticles to result in stable and uniform nanoparticle covered foam for antibacterial applications.

Bacterial contamination is a major issue concerning environment. The World Health Organization (WHO) standards for drinking water are that any 100ml water sample collected should not contain a single bacterial strain.

This invention proposes a simple and direct method of coating polyurethane foams (PU) with silver nanoparticles and the coated foams can be used for different antibacterial purposes.

According to this invention, the process for the manufacture of polyurethane foam coated with silver nanoparticles comprises the steps of soaking the said foam in a solution of nanoparticles of silver, the solution being of 10^{-3} molar concentration of silver and the said nanoparticles being in the size range 1 – 100 nano metres; the coated foam being washed and dried thereafter.

EXAMPLE

Cleaned PU foam of 2-20 mm thickness commercially available were soaked with nanoparticle solutions of silver in the size range of 60-80 nm prepared by the standard citrate reduction method. This method involves heating 1 litre of silver nitrate solution (10^{-3} molar) in water to reflux and adding 40 ml (1% by weight) of sodium citrate solution in water and continuing the boiling for five minutes after which the solution colour changes to golden yellow. The nanoparticle solution thus formed is cooled to room temperature by leaving it outside the heater. The PU foams were exposed to the solution of nanoparticles for 6 hours. The foams were repeatedly washed with water to remove any adsorbed ions and were then air dried.

These treated foams were found to be effective as antibaterial water filters as no bacterial strain was detected in water samples having a load of 10^5 CFU/ml (colony forming units/ml) of *E.coli* strains such as ATCC 25922 and MTCC 1302, when exposed to the said coated foams.

The amount of silver coated must be more than 0.001 % and less than 0.1% (by weight). The nanoparticles are retained on the surface of the foam for several months.

Preferably, the PU foam used must be hydrophilic and of food grade quality if they are to be used for drinking water filters.

Apart from the above mentioned application, the coated foam can be used for anti-bacterial and antiseptic purposes in products such as footwear, textiles, clinical, medicinal packaging, as a part or whole of products.

The terms and expressions herein are of description and not of limitation having regard to the scope and ambit of this invention.

We Claim:

1. A process for the manufacture of polyurethane foam coated with silver nanoparticles comprising the steps of soaking the said foam in a solution of nanoparticles of silver, the solution being of 10^{-3} molar concentration of silver and the said nanoparticles being in the size range of 1-10 nano metres; the coated foam being washed and dried thereafter.
2. The process for the manufacture of polyurethane foam as claimed in Claim 1 wherein the foam is soaked in the said solution for 2-8 hours.
3. The process as claimed in Claim 1 or Claim 2 wherein the silver coating concentration must be more than 0.001 % and less than 0.1% (by weight).
4. The process for the manufacture of polyurethane foam coated with silver nanoparticles substantially as herein described and illustrated with reference to the Example.
5. Polyurethane foam coated with silver nanoparticles whenever

manufactured by a process as claimed in any one of the preceding Claims.

Dated this 3rd day of September 2004

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ABSTRACT

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A process for the manufacture of polyurethane foam coated with silver nanoparticles comprising the steps of soaking the said foam in a solution of nanoparticles of silver, the solution being of 10^{-3} molar concentration of silver and the said nanoparticles being in the size range 1-10 nano metres; the coated foam being washed and dried thereafter.