

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM



PROJECT REPORT ON

**“STUDIES ON SINTERING CHARACTERISTICS OF NANO SILVER
DOPED WITH COLLOIDAL SILICA”**

Submitted in partial fulfillment of the requirements for the award of
Bachelor of Engineering

IN

MECHANICAL ENGINEERING

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ABSTRACT

In Nanotechnology, a Nano particle is defined as a small object or particle that behaves as a whole unit in terms of its transport and properties. Nanotechnology takes advantage of the fact that when a solid material becomes very small, its specific surface area increases, which leads to an increase in the surface reactivity and quantum-related effects. The physical and chemical properties of Nano materials can become very different from those of the same material in larger bulk form. Nano materials (such as Nan tubes and Nan rods) and Nano particles are particles that have at least one dimension in the range of 1 to 100 nm. Nano particles are classified solely based on their size, and may or may not exhibit size-related properties that differ significantly from those observed in bulk materials. Due to the properties of silver at the Nano scale, Nano silver is nowadays used in an increasing number of consumer and medical products. Nano materials are Nano particles that have special physicochemical properties as a result of their small size.

Silver has been valued throughout history for many of its properties that are useful to humans. It is used as a precious commodity in currencies, ornaments, jewellery, electrical contacts and photography, among others. One of the most beneficial uses of silver has been as a potent antibacterial agent that is toxic to fungi, viruses and algae. Silver has long been used as a disinfectant; for example, the metal has been used in treating wounds and burns because of its broad-spectrum toxicity to bacteria as well as because of its reputation of limited toxicity to humans.

One important use of silver Nano particles is to give products a silver finish. Nano silver's strong antimicrobial activity is a major reason for the development of Nano silver containing products. Of the more than 1000 consumer products that contain Nano materials, roughly 25% are claimed to contain silver Nano particles. Widely available consumer products that contain Nano silver include food contact materials (such as cups, bowls and cutting boards), odour-resistant textiles, electronics and household appliances, cosmetics and personal care products, medical devices, water disinfectants, room sprays, children's toys, infant products and 'health' supplements.

Some of the applications of Nano silver have resulted in government concern and discussions among the public because, once released into the environment, the mobility, bioavailability and toxicity of Nano silver on any ecosystem is determined in part by its stability in the environment. An example of this is the addition of silver Nano particles to socks in order to kill the bacteria associated with foot odour. Several studies have shown that silver can easily leach into wastewater during washing, thus, potentially disrupting helpful bacteria used in wastewater treatment facilities or endangering aquatic organisms in lakes and streams. Some brands of socks were shown to lose nearly all of their silver content within a few washings. There is clear evidence that silver, and in particular Nano silver, is toxic to aquatic and terrestrial organisms, a variety of mammalian cells *in vitro*, and may be detrimental to human health. Surprisingly, there is little to no information on the behaviour of silver Nano particles in the environment.
