CHAPTER 1
INTRODUCTION

Professor Richard Feynman delivered an influential lecture “There’s plenty of room at the bottom” on December 29th, 1959, at the American Physical Society meeting held at California Institute of Technology (Caltech), his lecture necessitates the implementation of miniaturization in technologies to be used in future to frame such devices, that make it more portable, energy eco-friendly devices, demanding minimum materials etc (Dario et al., 1992). Now a day’s concept of miniaturization is being given a full support which can be evident from the fact that almost all electronic, magnetic, sensing, optical, energy and volumetric devices are made as tiny as possible (Suh et al., 2009).

Nanosciences have substantially affected all areas of natural and applied sciences which entail material science, physics, chemistry, biology, medicine, microbiology, biotechnology and engineering (Alivisators, 1996; Chan and Nie, 1998; Dujardin and Mann, 2002). This influence is also possible in biomedical sciences where the complex biological components such as DNA, proteins, the basic biological entities and atoms, biomolecules like enzymes, etc. fall in the nanoscale dimension (Hobson, 2009).

The new field called “Nanobiotechnology” evolved from the various applications of nanoscience in the field of biotechnology, biosensing, medicine and microbiology because of their comparable sizes as nanomaterials has been used to knit most of the biological systems with it (Fortina et al., 2005).

The consolidation of nanomaterials with bimolecular, exemplified an excellent applications in biomedicine been undertaken which determine the properties of nanomaterials which influence their interaction with microorganisms and experimentally examine the effect on bacteria after being in contact with nanomaterials.
Two kinds of approaches exclusively a “top down” approach or a “bottom up” approach could be practiced to develop nanoparticles (Sepeur, 2008). Now coming to top-down synthesis, which take the advantage of size reduction method to produce nanoparticles with the help of a suitable starting material (Meyers et al., 2006). The major limitation of top down approach is that it incorporates defects pertaining to surface structure of the product, in addition to that dependency of surface chemistry and the other physical properties lies on the surface structure of product (Thakkar et al., 2010).

Comparing to earlier approach, bottom up production method; exclusively assembled the nanoparticles are from several such smaller entities, for instance, including atoms, molecules and smaller particles. Final particle are resulted from the assembly of the preformed nanostructured which are basic to nanoparticles.

Today environment adulteration poses major challenges, thus there is urgent necessity of green synthesis bioprocesses in the areas of chemistry and chemical technology, and moreover it has been finding widespread interest. The bio Synthesis of nanoparticles from corresponding metals is carried out through several routes. In order to develop less hazardous chemical synthesis, the classic guide for chemists and chemical technologists is now the 12 principles of green chemistry (Anastas and Warner, 2000). Many books on green chemistry have been published in the last 2 years (Anastas and Horvath, 2012; Ahluwalia, 2012; Patel et al. 2012) which include several green processes and their technical facet like ultrasound, microwaves as well as synthesis approach such as green engineering and manufacturing (Mulvaney, 2011; Allen and Shonnard, 2001), green tribology (Nosonovskv and Bhushan, 2012), polymers and polymerization (Mathers and Meier, 2011; Cheng and Gross, 2010), green analytical chemistry (De la Guardia and Garrigues, 2012), waste water treatment (Lofran, 2012), biomass and biocomposites, biofuels, particle technology, hydrogen and syngas production and uses and other areas of green chemistry (Foo, 2012; Schiebl, 2012).

From the early knowledge of 1900s, that the plant extracts has the ability to reduce metal ions, but the nature of the reducing agents remain elusive. In the last 30 years (Gardea-
Torresdey et al., 2003; Armendariz et al., 2004; Gericke and Pinches, 2006; Marshall et al., 2007; Parsons et al., 2007; Kumar and Yadav, 2009; Ankamwar, 2010; Beattie and Haverkamp, 2009; Iravani, 2011; Park et al., 2011; Kandasamy et al., 2013), the mainstay of attraction was the accessibility in the use of either intact plants or raw plants and its extracts for the scrapping of metal salts to nanomaterials became a major point of extraction. The use of plant extracts for producing was considered to be the simpler method. The processes are pertaining to scalability and may be prudent (Iravani, 2011).

However nanoparticles too have hostile effects which are still unknown in spite of vigorous development in nanotechnology. The biosynthesis methods allows to inculcate such intimate environment and biologically more amicable reagents which scrap down the toxicity pertaining to resultant substance and the effect of its side products on the environment (Sanchez-Mendieta and Vilchis-Nestor, 2012). So, to achieve this target, the conditions put up into work were those solvents (exclusively water) that are devoid of any kind of toxicity, green methodologies devoid of associated reaction media as well as air (entailing ultrasound, microwave, hydrothermal, magnetic, biological methods, amid others) and tropical temperature. Basically we take into account biosynthesis methods to develop nanoparticles and nanomaterials using plant extracts.