1. Introduction

1.1 Motivation and Objective

„*Nanotechnology*“ is undoubtedly one of the most prominent catchwords of today, but scarcely anybody associates therewith all the different contributions to our everyday live. Many of the associated inventions in chemistry, pharmacy (drug delivery), electronics (as seen in the downscaling of computers, cell phones etc.), food technology, cosmetics but also adhesive and pigments (carbon black and highly disperse silica gels) are omnipresent. The term “nano” originates from the Greek word for “dwarf” and describes the size scale of 10^{-9} m. For comparison sake, an average hair is about 60 µm in diameter. There are several reasons for the boom in nanotechnology: First of all, rational design of materials in the nanometer range grants access to materials having new properties which would be inaccessible by macroscopic manipulation (e.g. hydrogen fuel cell, membrane technology, hydrogen storage). In addition, acquirements in surface processes result in a better understanding of catalytic processes. In this context, G. ERTL has been awarded the 2007 Nobel Prize in Chemistry for his research on surface chemistry of catalytic processes this year. Of course, these inventions are not only limited to technological applications, they also improve diagnosis and therapy methods. Appropriate nanoparticles applied as contrast agents in living organisms allow gaining valuable perceptions on complex biological processes. Further interesting recent examples include the exceptional electronic and optical properties of carbon nanostructures, among them the very famous Buckminsterfullerene[1] and carbon nanotubes[2] (Figure 1.1). Prototypes of flat panel displays made from carbon nanotubes have several advantages over commercial liquid crystal displays, such as low power consumption,

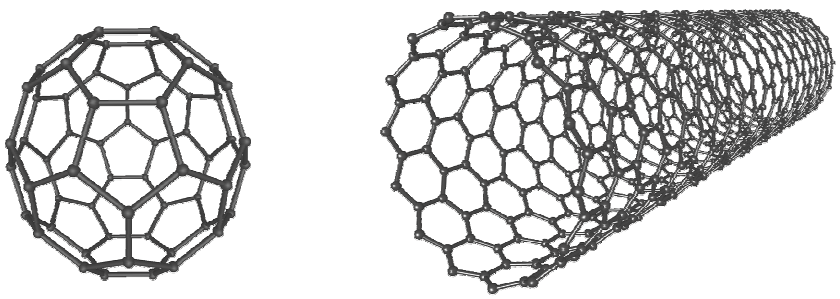

Figure 1.1: Scheme of C_{60}-Buckminsterfullerene and single layer carbon nanotube