CHAPTER I
INTRODUCTION

The liquid droplet impact on a solid surface has been studied for more than a century. There are various kinds of applications mostly in the industrial areas such as spray coating, spray painting, delivery of agricultural chemicals, spray cooling in steel industry, and ink-jet printing, as well as soil erosion due to rain drop impact. Early researches attempted to identify the important parameters influencing the final outcome impact on a solid surface by allowing a natural falling of liquid droplets. Recent researches have tried to quantify the influence of all parameters in order to obtain a better understanding of the impact phenomena.

Various phenomena can be used to describe from the liquid droplet impact onto solid surfaces. The phenomena of liquid droplet impact are grovemed by several factors such as the properties of liquid solution and the type of solid substrate, size and height of liquid droplets. The properties of liquid solution are density, viscosity, and surface tension. Regarding the properties solid surfaces, the surface free energy which can be expressed interms of hydrophobicity or hydrophilicity surface and surface roughness can play an important role in the impact phenomena. The initial stage of a falling liquid droplet which is considered to affect significantly the impact phenomena depends on the size, the initial height and density of the liquid droplet. The impact phenomena of a falling liquid droplet on a solid substrate can be classified into different outcomes such as deposition, corona splash, receding break-up, rebound, and partial rebound (Rioboo *et al*, 2003).

Previous researches tried to describe the liquid droplet impact onto solid surfaces by using both analytical and numerical methods in order to obtain better accuracy droplet model. There are several dimensionless parameters used to describe the impact phenomena such as flattening factor (ξ) which is defined as the ratio of film thickness to the drop diameter. This parameter used to observe the change of droplet thickness in vertical direction. The spreading factor (β) which is defmded as the ratio of the droplet diameter in horizontal direction to the original droplet diameter before impacting the solid surface.The weber number (We) and Reynolds number are respectively defined as the ratio of inertial force to the surface tension and viscous force. However these dimensionless parameters are still not significant to explain the whole phenomena of liquig droplet impact.

Although several studies of droplet impact phenomena were conducted, few analyses of rebound have been reported. The purpose of this research was to observe the rebound phenomena of the impact of water droplets on a super hydrophobic surface which was a plasma-treated polypropylene film coated on a glass surface. A high-speed camera was used to capture the images of falling droplets on the surface and the rebounding water droplets in millisecond range (2900 images per second). The impact velocity was varied by adjusting the needle height in order to obtain various rebound phenomenon. The volume and the center of mass of liquid water droplets were obtained by using the 2007 AutoCAD program. Moreover, the movement of the rebounded droplets in the air by observing the changes of the center of mass of the water droplets was used to calculate both kinetic and potential energy before and after impacts.