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PHASES OF DEPOSITED CARBON FILMS BY PULSED LASER DEPOSITION - REVIEW ZAINEB FADHIL KADHIM, EKBAL MOHAMMED SAEED, HAIDER A. H. AL-JUBOURI Department of Metallurgical Engineering, College of Engineering Materials, University of Babylon, Iraq ABSTRACT Carbon is considered to be a crucial element in engineering because of its allotropy phenomena, as the deposition of carbon leads to different phases with various properties. Surfaces are the fundamental sites of contact between any material and area where it exists. Surface treatment provides a means to overcome any problem between the surface and its surrounding. Pulsed Laser Deposition (PLD) is found to be among the more substantial depositing techniques in solid state physics and analytical chemistry. It is an excellent technique for tissue engineering applications used in depositing different structures of carbon like thin films. This paper reviews the technique of pulsed laser deposition as a method of physical vapor depositing, as well as its primary steps. Many researchers used this method to deposit carbon on different substrates, in addition to different structures of carbon such as diamond, graphite, graphene, pyrolytic carbon, nanotubes, and amorphous carbon. KEYWORDS: Carbon, Physical Vapor Deposition (PVD), Pulsed Laser Deposition (PLD) & Surface Engineering

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1. INTRODUCTION

Carbon is a nonmetallic element. It is quadrivalent and characterized by its ability to form chains and ring compounds. It is conventionally classified as a ceramic due to its long-established application as a refractory for its exceptional high-temperature endurance [Brady, 1996] [Smallman,1999].

Organic chemistry is a branch which mainly focuses on carbon compounds, as these are found in all organic substances obtained from vegetation and animal life. Carbon is found in form of hydrocarbons in petroleum, and as carbohydrates in coal and plants. With a rise in temperature, carbon extinguish, thereby absorbing oxygen so as to create simple oxides CO and CO2, where the latter is the stable oxide that exists within the atmosphere and functions as a nutrient for plants [Brady, 1996].

Carbon exists naturally in different allotropic forms: transparent crystalline carbon (diamond), crystalline carbon graphite, pyrolytic carbon, and glassy carbon. Throughout the last few decades, several kinds of carbon nanomaterials have been discovered: fullerenes in 1985, carbon nanotubes (CNTs) in 1991, and single-wall carbon nanotubes (SWCNTs) in 1993, followed by graphene and Q carbon in 2007 and 2015, respectively. Depending on their physical and chemical characteristics, carbon nanomaterials enforcements includes a broad scope varying from hydrogen storage to medical implanting [Constantin, 2016; Jagdish, 2015]. The elemental phases of carbon are:

Diamond: It has the cubic structure consisting of a network of regular tetrahedral arrays as in Figure (1a). Diamond is considered to be of great use because of its physical characteristic such as its relatively higher hardness value and its ability to resist wear. Other properties include being optically transparent, thermally conductive, and