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► **To cite this version:**

Adèle Girardeau, Guillaume Carnide, A F Mingotaud, M Cavarroc, M L Kahn, et al.. Pulsed aerosol assisted plasma deposition: influence of the injection parameters on ZnO/DLC nanocomposite thin films. *Platinum* 2021, Sep 2021, virtual, France. pp.74. <hal-03374856>

HAL Id: hal-03374856

<https://hal.science/hal-03374856v1>

Submitted on 12 Oct 2021

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Pulsed aerosol assisted plasma deposition: influence of the injection parameters on ZnO/DLC nanocomposite thin films

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Aerosol-assisted processes enable to deposit thin films, homogeneous [1,2] or nanocomposite [3,4,5,6]. For example, the nebulization of colloidal solutions, *i.e.* liquid solutions containing nanoparticles, in different plasma processes has been widely used for nanocomposite thin film deposition. However, nanoparticles loaded droplets in the aerosol lead to the deposition of aggregated nanoparticles embedded in the matrix.

Recently, a new process of nanoparticles injection has been developed [7]. This method, called reactor-injector of nanoparticles, consists in synthesizing nanoparticles prior to their injection in the plasma in a pulsed injection regime. It enables to form nanocomposite thin films with really small (<10 nm in diameter) and highly dispersed nanoparticles embedded in the matrix [7].

This work aims to study the deposition of ZnO/DLC nanocomposite thin films in a low-pressure RF plasma. The main challenge of this process is to find the best compromise between the parameters for an efficient synthesis of ZnO nanoparticles and an optimal behaviour of low-pressure RF plasmas in a pulsed regime. It is shown that the operating window enables to deposit nanocomposite thin films with an extended range of volume fraction.

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