

Preparation of Aluminium Nanoparticles by Pulsed Wire Discharge and its Particle Size Control

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Aluminium is the lightest metal with a very low specific weight and has many applications. Among them, aluminium nanoparticles are catalysts for promoting chemical reactions. However, it was difficult to prepare aluminium nanoparticles because of the large surface area and the rapid oxidation in air. Various passivated metal nanoparticles of including magnesium¹ and titanium² were prepared by pulsed wire discharge(PWD). In this study, this method was chosen for the preparation of aluminium nanoparticles.

Aluminium wires with 0.30mm in diameter and 25mm in length were used. Then one of the wires were connected to capacitors of 30 μ F charged at 3.5kV, 4.5KV and 6.0kV in Ar gas at 10kPa, 50kPa and 100kPa. The phases in the powder were analysed by using x-ray diffraction. The morphology of the particles were studied by using a transmission electron microscope(TEM).

XRD patterns of the prepared nanosized powders are shown in Fig. 1. All peaks matched to those of metallic Al. The Al phase was confirmed in all the conditions. TEM bright field images of the prepared nanosized powders are shown in Fig. 2. The particle size can be decreased with decreasing gas pressure and increasing voltage. Most of them were seen spherical. From the experimental results, aluminium nanosized powders were successfully obtained.

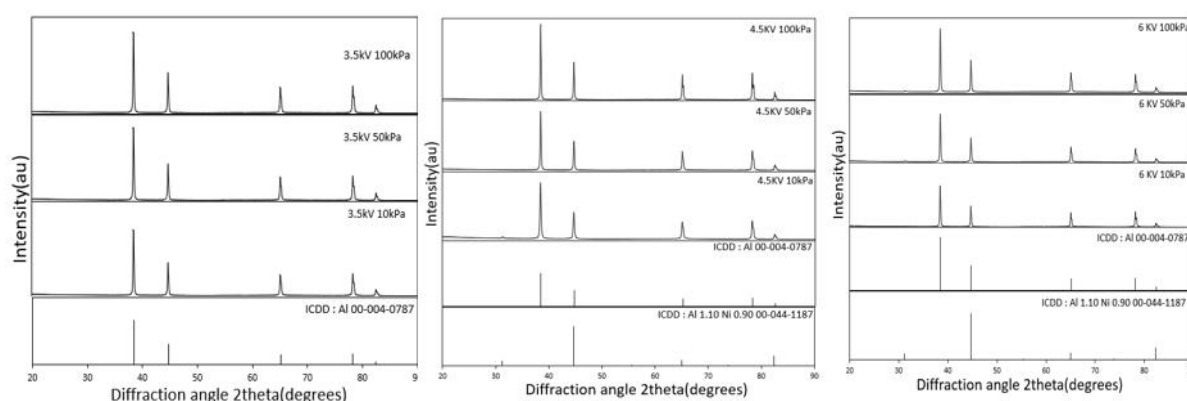


Fig 1. XRD measurement

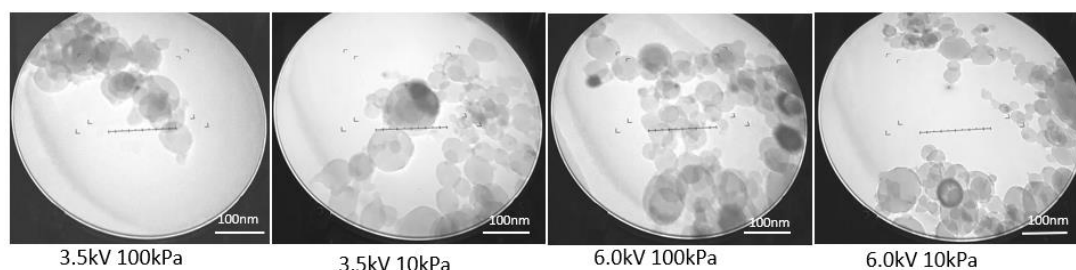


Fig 2 TEM images

References:

1. Hieu et al. *Jpn. J. Appl. Phys.*, 57 02CC04(2018).
2. Tokoi et al. *Jpn. J. Appl. Phys.*, 49, 116201 (2010).