AN ELECTROSTATIC PRECIPITATOR FOR CAPTURING NANOPARTICLES

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ABSTRACT

The ability to capture particles in the nanosize range (1-100 nm) with a single stage parallel plate electrostatic precipitator is studied. With the development of sophisticated nanoparticles synthesis techniques, the electrostatic precipitator also provides a powerful tool for collecting nanoparticles. Specifically, the investigation is further by varying the types of plates, distances between plates, variety types of dust and magnitude of supply voltage in order to find the factor that effect electrostatic precipitator performance for capturing nanoparticles. In this project it proved that the variable parameter influence the performance for capturing particles. The suitable distance was achieved is 2 cm for ESP to capture nanoparticles moreover the required voltage also not extremely high just 1kV to 2 kV. While the suitable plate employed in this project is copper brass plate which it illustrate the better performance in capturing more weight and smaller size than others plate.

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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

The environmental pollution has become, during the recent years, a crucial problem of public concern, and the authorities are requested to set increasingly more stringent limits for the emissions from the industrial plants for solid particulate and other gaseous pollutants. The electrostatic precipitator, as a consequence, has become one of the most commonly employed particulate control devices for collecting aerosols from utility boilers, incinerators, and many other industrial processes[1, 2].

With the development of sophisticated nanoparticles synthesis techniques, the electrostatic precipitator also provides a powerful tool for collecting nanoparticles from an aerosol or plasma reactor[3]. The greatest advantage provided by an electrostatic precipitator is that the electrostatic force of highly charged particles under the influence of an external electrostatic field is usually very large, as compared to gravitational, thermal, and inertial forces[2]. The basic principle of electrostatic precipitation is that gas-borne particles are passed through an electric field where they are initially charged by means of a corona discharge. Charged particles are then deflected across the electric field and deposited on collecting electrodes. Therefore, the process are production of an electric field to create corona and ions ,charging of the particles by the ions ,effect of the charged particles on the electric field ,migration of the charged particles through the field and finally collection and removal of the charged particles[4].

Most industrial ESPs are based on a single stage approach in which both charging and migration across the field (precipitation) take place within the same set of electrodes, as illustrated in Figure 1-1.