International Conference on
Materials Science and Research

November 16-18, 2017 Dubai, UAE

Modeling and Experimental Study of a Wurster Type Fluidized Bed Reactor Coupled with an Atmospheric Pressure Plasma Jet (Appj) for the Treatment of Polypropylene (Pp) Powders

Seyedshayan Tabibian[1]*, Farzaneh Arefi-Khonsari[1], Saleh Khashayar[2], Mikel Leturia[2], Antoine Mousallem[1] and **Jerome Pulpytel[1]**
[1]Sorbonne University, UPMC Univ Paris 06, CNRS, Laboratoire Interfaces et Systemes Electrochimiques, France
[2]UTC, TIMR, rue Roger Coutolenc, France

Poly Propylene (PP) powders are used for various purposes. However, its good mechanical properties are accompanied by poor wettability. The PP powder was therefore modified by a pulsed arc atmospheric pressure plasma jet (APPJ) in a homemade Wurster fluidized bed reactor (Wurster-FBR). The physical and chemical modifications of the treated PP powders as compared to the nontreated ones were determined by water contact angle (WCA) measurements, X-ray photoelectron spectroscopy (XPS), attenuated total reflection Fourier transform infrared spectroscopy (ATR-FTIR) and SEM for morphology observations.

The average diameter of our PP powders being determined to be 700 μm, they can be classified as particles of category B according to Geldart classification which can be easily fluidized.

The plasma torch was introduced into transparent glass reactor with 118mm insidediameter, placed in the middle of a bronze gas distributor. An internal Wurster tube was added to control the residence time of particles in the plasma jet, and therefore the homogeneity of the treatments. The innovative design of wurster tube improved the powders treatment process by increasing the interaction between plasma torch and the particles, therefor the efficiency of system increased.

A 2D CFD model was developed using Comsol Multiphysics 5.2 along with this experimental study. The multiphase flow was calculated by using the k-e turbulent Euler-Euler model which solves one set of Navier-Stokes equations per phase to accurately describe theparticles velocity and volume fraction inside the reactor.
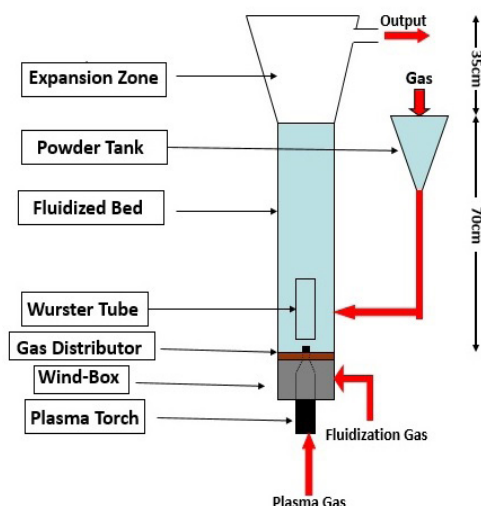
Polypropylene Plasma Treatment, CFD Modeling

Key Words: Atmospheric-Pressure Plasma Jet, Fluidized Bed Reactor, Wurster Reactor

Int J Mater Sci Res. 2017
IJMSR an open access journal

ICMSR-2017
November 16-18, 2017

Conference Proceedings

Page 101