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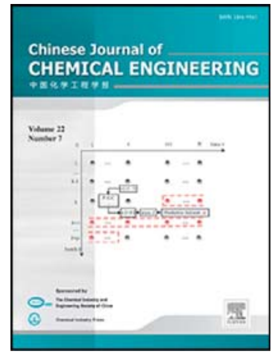

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Droplets Diameter Distribution Using Maximum Entropy Formulation combined with a New Energy-Based sub-model

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Abstract The maximum entropy principle (MEP) is one of the first methods which have been used to predict droplet size and velocity distributions of liquid sprays. This method needs a mean droplets diameter as an input to predict the droplet size distribution. This paper presents a new sub-model based on the deterministic aspects of liquid atomization process independent of the experimental data to provide the mean droplets diameter for using in the maximum entropy formulation (MEF). For this purpose, a theoretical model based on the approach of energy conservation law entitled *energy-based model (EBM)* is presented. Based on this approach, atomization occurs due to the kinetic energy loss. Prediction of the combined model (MEF/EBM) is in good agreement with the available experimental data. The energy-based model can be used as a fast and reliable enough model to obtain a good estimation of the mean droplets diameter of a spray and the combined model (MEF/EBM) can be used to well predict the droplet size distribution at the primary breakup.

Keywords—Mean Droplets Diameter; Energy Conservation; Maximum Entropy Formulation (MEF); Size Distribution; Statistical Thermodynamics; Mathematical Modeling

1 Introduction

The droplet size distribution in sprays is one of the vital parameters required for fundamental analysis of practical sprays. Detailed information about the droplets size distribution is consequently important for the design, performance and optimization of spray systems [1].

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