

## **Influence of suspended solid particles on suspension atomization processes**

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### **Abstract**

The process of atomization of liquid/solid suspensions is utilized in several industrial applications. The break-up process of suspension liquids in an atomization process differs from that of a single phase, pure liquid by the influence of the suspended particles on the fragmentation kinetics. The contribution analyses this solid particle influence on the fragmentation process of a suspension filament or sheet within the suspension atomization process.

The suspension atomization process is studied. Model suspensions with various suspended particle types are atomized. From drop size analysis it is found that the suspended solid particle size has a main influence on the resulting spray drop size distribution. The atomization of the suspension with larger solid particles may exhibit a bimodal distribution, where by the water drops separate from the solid particles. The liquid drops diameter is controlled by the solid particle size and the transfer of the aerodynamic energy to the suspension jet. On the other hand the atomization of the suspension with small solid particles shows a monomodal distribution, in which the solid particles can not separate from each other and the drops in the spray cone are suspended drops; their diameter is controlled by the transfer of the aerodynamic energy to the suspension jet. The relevant fragmentation energy determines whether the liquid disruption process is controlled by the liquid or by the solid particle properties of the suspension.

For a more detailed analysis of the suspension fragmentation process, the break-up of a stretching suspension ligament is studied. Here, the process of stretching separation and satellite droplet formation of two suspension droplets after a collision process is studied in detail. Therefore, an experimental study of binary collisions of suspension droplets in off centre collisions (impact parameter of  $B > 0$ ) is discussed. Two suspension droplet streams of equal size have been generated by means of piezoelectric droplet generators. The drop velocities of the two streams of suspension drops are varied systematically to change the Weber number of the collision. Also the type and size of suspended solid particles is changed.

Key words: suspension atomization, ligament break-up, droplet collision, satellite drop formation

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