Evaporation characteristics in nebuliser based humidification and drug delivery devices

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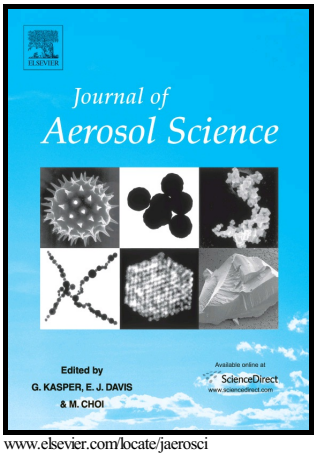

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Abstract

In an effort to better understand the droplet evaporation characteristics in nebulizer based humidification and aerosol based drug delivery, this paper investigates the variation in the droplet size distribution and the amount of water evaporated from the droplets. The experimental part was conducted on droplets generated by an ultrasound atomizer and delivered to a stream of air flowing along a conduit as is typically found in medical respiratory therapy devices. For the theoretical part a poly-disperse droplet evaporation model was developed and validated by the experimental results. A feature of this investigation is the consideration of the changes to different droplet size ranges (lower, middle and upper) within the droplet size distribution to better understand the evaporation process and also provide a more detailed comparison with the analytical model. As expected the experimental results show that increasing the air temperature and conduit length increase the amount of water evaporated and cause a shift in the droplet size distribution. However, changes to the droplet size distribution are also attributed to the fact that large droplets are possibly being removed from the air stream due to settling in the apparatus. The poly-disperse evaporation model accurately predicted water evaporation and changes to the median droplet sizes in the distribution.