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Numerical simulation of droplet impact onto a solid sphere in mid-air SAYED ABDOLHOSSEIN BANITABAEI, ALIDAD AMIRFAZLI, York University — Collision of a droplet and a particle in mid-air has applications in chemical, petrochemical, and pharmaceutical industries. As a result of a head-on collision between a droplet and a hydrophobic particle with a relative diameter of a thin liquid film is created in the form of a hallow truncated cone (i.e. lamella). In this work, a numerical simulation was developed based on VOF method for head-on collision of a falling droplet and a moving particle. Impact outcomes predicted by the model shows a fair agreement with the experimental images of lamellas (V_p =6.8 and V_d =0.68 m/s) . Using the simulation model, the effect of liquid viscosity and surface tension on impact outcomes were studied. As viscosity increases, the lamella thickness increases accordingly. This happens as more energy transfer is required to move the liquid layers against each other to create a longer, and therefore thinner, lamella. However, a small decrease in viscosity halts the lamella formation as the boundary layer thickness in the spreading liquid gets so small that a crown cannot be developed. Moreover, investigation of the effect of particle wettability on the impact outcomes indicates that a lamella only forms due to impact of a droplet onto a hydrophobic particle. The lamella geometry is not affected by the particle wettability after contact angle reaches a certain threshold. These results show a good agreement with the literature of drop impact on a stationary particle.

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