Water Droplet impacting on the hydrophobic surface

-Sachin D. Kanhurkar, PhD Research Fellow, IIT Bombay.

As in the current scenario, the droplet impact study on different surfaces is going to have more importance because of the COVID-19. I am presenting here the droplet impact on the Teflon like hydrophobic surface (i.e., contact angle> 90 degrees). I used the level set method to capture the liquid-air interface, and the system governed by the well known Navier-stokes equations. In an attached figure below, I am showing the only half cut of a drop by a blue line, and red arrows show the velocity vectors in the domain. The study shows that the impact of a drop on the surface is mainly first spread because of the inertia force and then follows the recoils because of the capillary force (i.e., surface tension force). We see a droplet spreading in Fig. (a-b), but then because of the more curvature of the interface (see Fig. c), the capillary force dominates over other forces, and the droplet interface starts to recoil. The droplet contact with the surface is less in the hydrophobic surface compared to the hydrophilic surface. So the takeaway is that we can control the droplet spreading on the surface by selecting the correct painting/polish material on the surface.

Water droplet impacting on the hydrophobic surface:

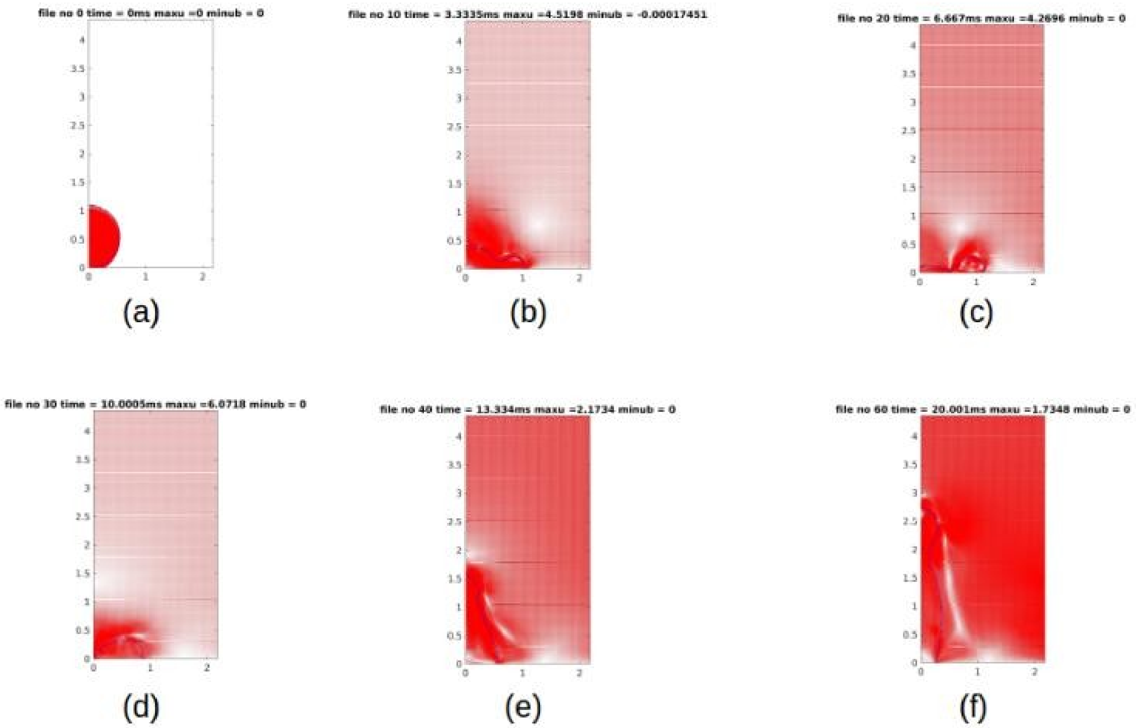

Fig.: Shows the evaluation of the interface of axissymmetric droplet impact on the teflon hydrophobic surface, We=20, Re= 2100, Dia= 3mm, impact velocity=0.7 m/s, surface tension = 72.7mN/m, **viscosity = 10^(-3)** Pas, density= 1000kg/m^3).