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Controlling Droplet Impact with Polymer Additives MICHAEL SMITH, University of Nottingham, VOLFANGO BERTOLA, University of Liverpool — When a water drop falls on to a hydrophobic surface, such as the waxy leaf of a plant, the drop often bounces off leading to wasted agrochemicals which harm the environment. However, adding small quantities ($\sim$100 μgml^{-1}) of a flexible polymer can completely prevent rebound. This is surprising since the shear viscosity and surface tension of such drops are almost identical to those of pure water. The effect has for some time been explained in terms of the stretching of polymer chains by a velocity gradient in the fluid, resulting in a transient increase in the so-called "extensional viscosity." We have developed an epi-fluorescent microscope system, to visualise the flow of fluid inside an impacting drop using tracer particles at 2000 fps. Analysis of the velocity as a function of radius showed negligible differences between water and polymer drops except near the edge, indicating that the extensional viscosity cannot be responsible for the anti-rebound effect. To probe the true mechanism, fluorescently labelled ?-DNA was used to visualise the edge of an impacting drop. During the retraction phase, DNA was shown to be stretched by the retreating droplet providing an "effective friction" at the contact line.

[1] M.I Smith and V. Bertola, Phys. Rev. Letts. 104, 154502 (2010).

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