Microrollers: dynamics and anisotropy

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Microrollers are rotating particles that become active close to a wall due to an asymmetric flow of the fluid around the particles. They can be experimentally realized by driving magnetic colloidal particles above a wall with a rotating magnetic field. The velocity of a microroller is much lower than the velocity of the fluid pumped around it. Therefore, the average velocity of a suspension of microrollers increases as a function of density. In addition, at high densities two layers are formed: a slow one close to the wall and a much faster one above it. We measure these velocities experimentally and compare them to high resolution Brownian dynamics simulations including lubrication effects. Finally, we will show the effect of anisotropy in the shape of the microrollers, by studying rod-like microrollers. While these rollers have a wide distribution in the orientations of their magnetic moments, we see similar instabilities as for spherical microrollers, but different dynamics in the formation of the instabilities.