

Size prediction of κ -carrageenan droplets formed in co-flowing immiscible liquid

Abstract

The formation of κ -carrageenan droplets in channel emulsification was experimentally investigated. The dispersed phase was vertically injected into co-flowing immiscible palm oil in the direction of gravity. This study focused on predicting κ -carrageenan drop size using force balance analysis. The force balance model considers the interfacial tension to be the solitary attaching force, while a combination of the drag force from the co-flowing palm oil and the body force of the extruding κ -carrageenan liquid act as the detaching forces. The conventional model gave poor predictions for droplet size, with an average relative deviation of 23%. This large deviation could be attributed to necking phenomena and an underestimation of the drag force generated on the shear-thinning κ -carrageenan solution. By incorporating correction factors, the average relative deviation of the force balance model dropped to 4%.