Supplementary Data Figures

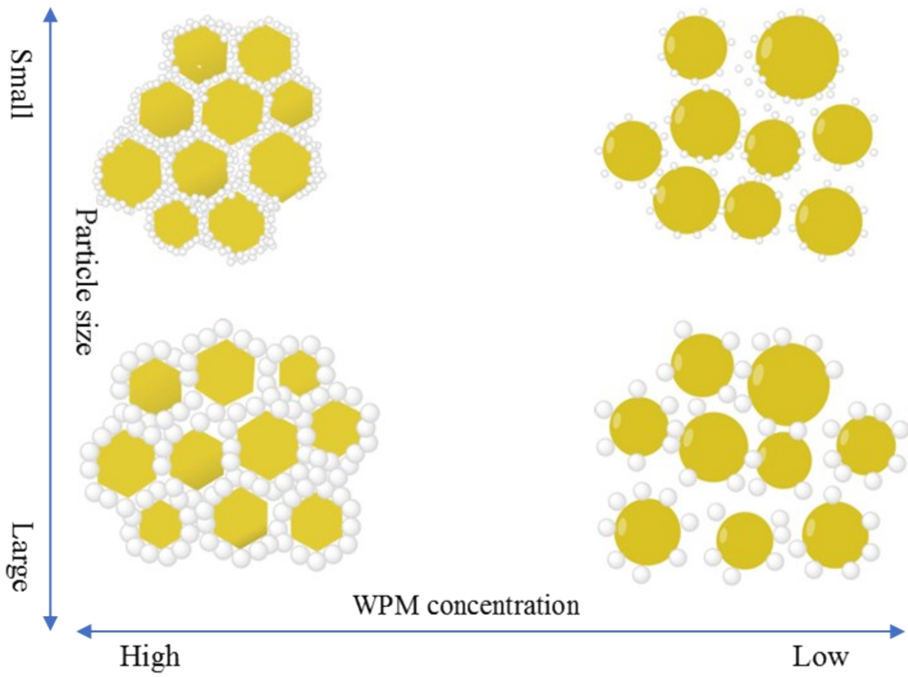

Figure S1 Schematic stabilization of oil droplets by WPM particles.

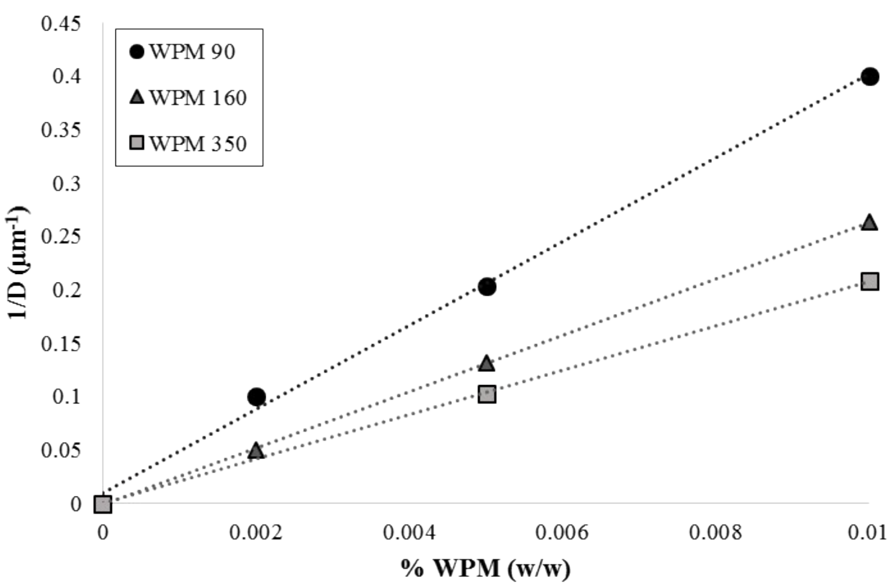

Figure S2 Plot of the inverse of particle diameter verses WPM concentration.

Notes on the Effect of pH on WPM

Microgelation will only occur in a narrow pH range with specific temperature (Phan-Xuan 2012). Microgelation of whey proteins is an equilibrium between attractive Van der Waals and repulsive forces. It is therefore expected that microgelation pH and protein concentration influence the characteristics of the generated particles. pH value had a remarkable effect on the size and ζ-potential of whey protein microgels; the higher the microgelation pH, the smaller the microgel particles. (Schmitt et al. 2007) found that microgel formation yield decreases with increasing pH up to the value of 6.1. Beyond 6.1, the coulomb repulsive force is so strong that it prevents protein particulation into fractal spheres but leads to formation of linear structures (Schmitt et al., 2009).

Rheology of HIPE

As it is illustrated in Figure S3, the effect of emulsifier concentration was more pronounced for HIPE stabilized by WPM, due to their being rigid particles and larger in size in comparison with WPI or Tween. Confirming the hypothesized particle size effect in Figure S1, the smaller the stabilizing particle, the more packed the morphology and the higher is the viscosity. Similarly, the effect of particle concentration was also observed on viscosity of the HIPE samples; by increasing the concentration, the viscosity would further increase.

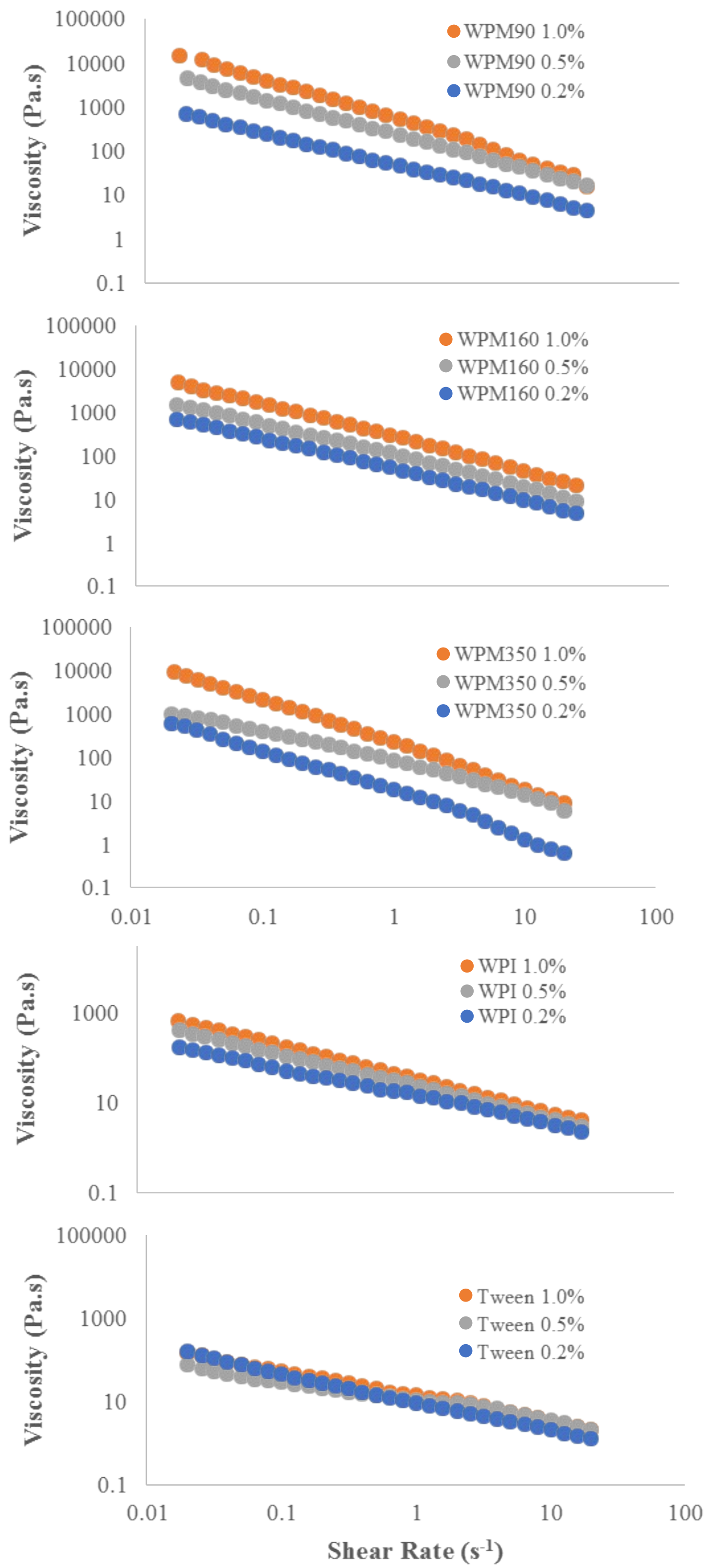

Figure S3 Viscosity vs shear rate of HIPE samples at different concentrations.

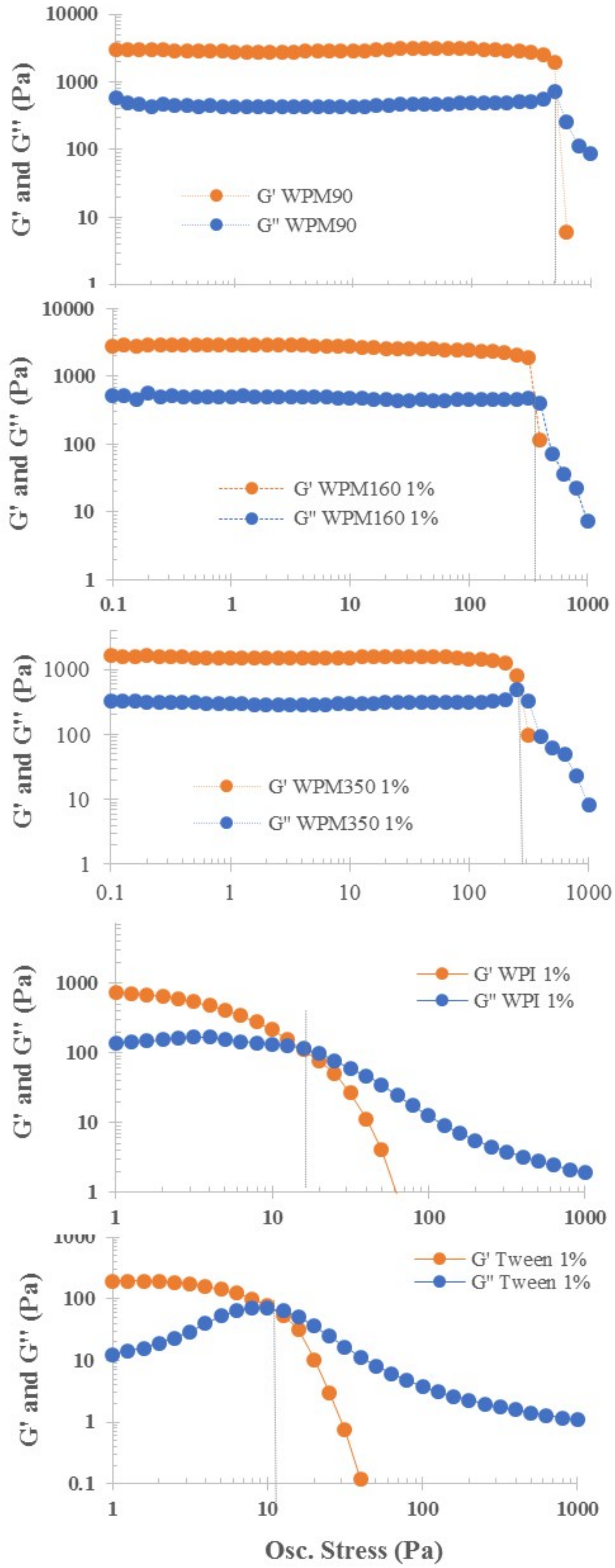

Figure S4 G’ and G’’ moduli vs oscillatory stress of HIPE samples.

At low amplitude G’ for all the samples was higher that G’’ (Figure S4). This indicates that the HIPE had more solid-like behavior, while at high amplitude the trend changes and after a crossover, which is considered as oscillatory stress yield, G’’ becomes higher than G’. This is related to the flow of the emulsions at this amplitude. Noteworthy, yield stress is an important parameter determining the processing properties of materials. There are different methods to calculate the yield stress (De Graef et al., 2011). The crossover of G’ and G’’ plotted against oscillatory stress is one of the methods used by many studies (Figure S3). Another way is to calculate critical stress at the end of the linear viscoelastic region (LVR). For this, complex modulus (G*) defined as the ratio between stress to strain and plotting the log G* versus oscillatory stress is needed. Critical stress then, could be obtained as the intercept of the lines that were fitted to the log G* against log oscillatory stress plot (Figure S5). Although the calculated amounts differ in the two methods, both exhibit similar trend (Table 2).

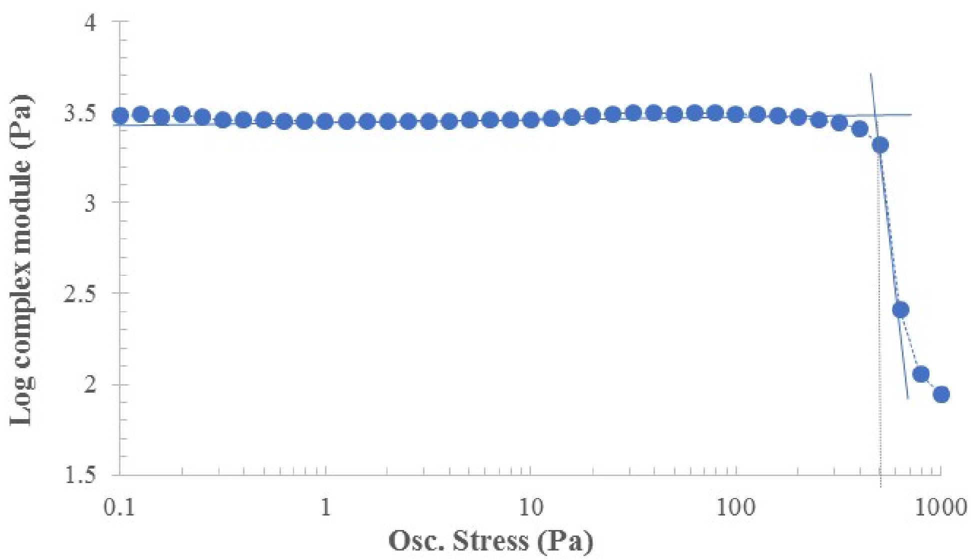

Figure S5 Calculation of the Critical stress for WPM90-stabilized HIPE.

The complex modulus is related to the rigidity of the sample and offers information about the sample microstructure. Elastic modulus within the linear viscosity region (G'_{LRV}) is related to weakness or strength of a gel (De Graef et al., 2011; Rosalina & Bhattacharya, 2002) and is defined as the average of elastic modulus before the yield stress. Within this region, the stress and strain are linearly related to each other and no breakdown in the structure occurs (Rosalina & Bhattacharya, 2002) (Table 2).