#35
COMPARISON OF DEPOSITION AND GELATION DERIVED WHEY PROTEIN FOULANTS

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ABSTRACT

Due to the natural variation in the properties of milk most researchers use milk products rather than pure milk for fouling and cleaning studies related to the dairy industry. The use of milk products allows the researcher to generate a foulant layer that has useful features in common with what would be obtained with pure milk, without the associated variations in behaviour. Due to the ease with which a reproducible milk-like deposit can be obtained with WPC (whey protein concentrate), it has become commonplace to use WPC solutions to model milk systems (at low temperatures, $<100^{o}$C, where the deposit is mainly proteinaceous).

Two WPC reaction mechanisms have attracted most attention to model milk systems: heat-induced deposition and heat-induced gelation. The effect of formation route on deposit behaviour , particularly during cleaning on exposure to agents such as dilaute alkaline solutions has been tracked over time by the technique of fluid dynamic gauging. These cleaning curves allow a macro-measurement of:

- swelling (the extent of depolymerisation of the protein structure on exposure to NaOH),
- stability (the ability of the deposit to resist protein removal resulting in structural alterations, i.e. shrinkage of the deposit), and
- adhesion (the force required to remove a deposit from the sample plate).

Comparison of the cleaning curves for each formation route thus offers an initial indication of protein structure in the different fouling types. The above parameters represent important macro indicators.

Heat-induced deposition and heat-induced gelation have been compared using such macro-measurements of the foulant, which have been used in turn to infer structural characteristics of the deposits and to understand protein-protein interactions within the deposits. The degree of correlation between the cleaning curves obtained for gelation and deposition systems has shown, alongside other evidence, that the two foulants cannot be used interchangeably for the modelling of milk systems. Both the process of gelation and the protein concentration of the deposit alter the nature of the foulant and affect cleaning characteristics.