MONITORING THE PROGRESS OF CLEANING USING OPTICAL DETECTION METHODS

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ABSTRACT

Regular and effective cleaning of food processing machines is essential to guarantee high food quality. Cleaning times in dairy industry make up about 15-40% of the total production time. Research results presented prior to this work show the influence of machine surface properties on cleaning efforts and the potential to reduce the cleaning efforts by the use of surface modifications.

The assessment of surface cleanability in food applications is based on the ability to provide test surfaces reproducible contaminated with model food soils and most important to quantify the amount of soil on the specimen with sufficient accuracy. In this paper, different optical approaches to detect soils based on starch and whey protein were analysed, namely (*i*) auto-fluorescence, (*ii*) UV-light detection and (*iii*) IR-detection. The first approach was performed with fluorescence microscopy and fluorescence spectroscopy in order to study the auto-fluorescence properties of several whey protein qualities (whey protein isolate, whey protein concentrate and different manufacturing technologies) and starch. All whey protein samples (adsorbed on stainless steel) showed fluorescence properties at an excitation frequency in the range of 280 - 350 nm. The intensities of the fluorescence signals were significantly different for the samples tested. No fluorescence properties were found for the starch samples. Further tests were performed using an IR-spectrometer. Here the relative adsorption at wave numbers in a range of 3359 – 13000 cm^{-1} was measured. For all tested whey protein and starch samples a specific adsorption spectrum could be found in the range of 7200 – 3350 cm^{-1}. The different why-proteins showed the same characteristic in this respect (Fig. 1).

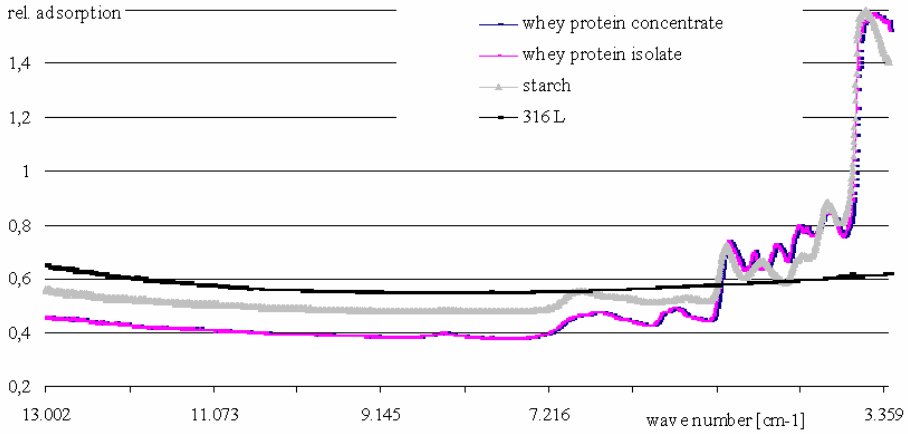

Figure 1: Relative adsorption of whey protein, starch and stainless steel depending on the wave number [cm^{-1}]

The optical detection methods tested so far show the potential to quantify the surface contamination. With the overall objective to investigate spray cleaning processes, the optical monitoring procedures will be scaled up to fit the existing test environment. Further tests and a calibration with different amounts of soils are necessary to achieve this aim.