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Swelling and hydration studies on egg yolk samples via scanning fluid dynamic gauge and gravimetric tests

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1. Introduction

Foods are complex examples of soft condensed matter (Mezzenga et al., 2005; van der Sman and van der Goot, 2009; Van Der Sman, 2012). Their physical and chemical properties show a strong dependence on moisture content (Labuza and Hyman, 1998). If low hydrated food samples are exposed to high moisture or liquid environments, the absorption of water into the food matrix can occur. This process leads, in certain occasions, to a change in the volume of the sample (swelling) and takes place until thermodynamic equilibrium is reached.

The reader must differentiate between *degree* of swelling and *kinetic* of swelling when a hydration phenomenon with an associated change in thickness occurs. *Degree* of swelling indicates the net increase in volume occurring in the sample over time. A swelling-ratio coefficient, typically defined as the ratio between the volume at equilibrium and the volume at dry state of the sample, is used to characterise this process. *Kinetic* of swelling relates to the speed at which the equilibrium is reached. It is typically characterised by a diffusion coefficient (Ganji, 2010).

Numerous approaches have been followed to model swelling/hydration phenomena in different foods. Some aim to fit experimental data by using empirical models. For example, this was done by Chen et al., (2007) for the modelling of swelling on cross-linked corn starch granules; by