OMICS Group Conferences
Accelerating Scientific Discovery

International Conference and Exhibition on
Food Processing & Technology

November 22-24, 2012 Hyderabad International Convention Centre, India

Bread characterization: Structure-property relationship

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Bubbles play a crucial role in many food products including bakery products, dairy foams, confectionery, breakfast cereals and extruded snacks. They give rise to aerated structures (food foams) resulting in novel food textures with desirable appearance. In the research and operational spheres, bubble science is still somewhat underdeveloped. Unfortunately researchers are realizing that in many cases a detailed, quantitative understanding of aerated foods is not available. Foam texture is significantly influenced by gas bubble size distribution and is the most difficult parameters to measure and analyse. However, its evolution with time is of great importance, since it is closely related to the final product quality. In some systems, a uniform bubble size may be desirable (e.g. bread dough and cake batter) which improve baking characteristics, while others, a wide spread in the distribution may be advantageous to achieve specific mouth-feel responses. Bread has a very high gas volume fraction (of the order of 0.68– 0.8) and therefore, has been treated as foam in the literature. An attempt has been made to understand the relationship between process parameters, foam structure and mechanical properties to obtain the desired structured product. Bread dough and bread have been characterized for rheology using controlled stress/ shear rheometer while the microstructure studies have been done using confocal laser scanning microscope (CLSM) and flat bed scanner respectively. In the bread dough investigation, the change in rheological and microstructuralproperties of bread dough as a function of water and yeast concentration is described. The rheological properties vary with the size of the bubbles and measurements were made on controlled shear/stress rheometer. CLSM accompanied with image analysis technique, was used to obtain microstructure of the bread dough. It was found that with an increase in water content, the moduli values decreased and the mean bubble diameter increased. As concentration of yeast increased, the bubbles became smaller and the moduli values increased. The effect of bubble size and bubble size distribution has been taken into consideration and an inverse relation between bubble size and storage modulus is found. The second part of the study on bread baking was done with similar set of parameters. Flat bed scanner, accompanied with image analysis was used to study the surface characteristics of bread. It was found that the effect of yeast and water content on bubble size in bread dough and bread is similar. During baking, bread was analysed at different time intervals to study the change in its rheological properties as the structure of the final product evolves. The mean the bubble size was measured along with the bubble size distribution. It was observed that as the baking progresses the mean bubble size decreases.

Biography

Rutuja Upadhyay did her Masters in Food Technology from Laxminarayan Institute of Technology, Nagpur and currently pursuing her PhD in Chemical Engineering from IIT Bombay. She is working on the Rheology and Micro-structure of Food Foams. She was awarded with the GNT Poster Award for Young Scientist for her contribution to the progress and quality of research to the development of new concepts or techniques, aiming at improving the food sector at the ISEKI Food Conference 2011 held in Milan. Her area of research is Food Process Engineering.

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