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# Food Foam Characterization: Rheology, Texture and Microstructure Studies

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**Abstract :** Solid food foams/cellular foods are colloidal systems which impart structure, texture and mouthfeel to many food products such as bread, cakes, ice-cream, meringues, etc. Their heterogeneous morphology makes the quantification of structure/mechanical relationships complex. The porous structure of solid food foams is highly influenced by the processing conditions, ingredient composition, and their interactions. Sensory perceptions of food foams are dependent on bubble size, shape, orientation, quantity and distribution and determines the texture of foamed foods. The state and structure of the solid matrix control the deformation behavior of the food, such as elasticity/plasticity or fracture, which in turn has an effect on the force-deformation curves. The obvious step in obtaining the relationship between the mechanical properties and the porous structure is to quantify them simultaneously. Here, we attempt to research food foams such as bread dough, baked bread and steamed rice cakes to determine the link between ingredients and the corresponding effect of each of them on the rheology, microstructure, bubble size and texture of the final product. Dynamic rheometry (SAOS), confocal laser scanning microscopy, flatbed scanning, image analysis and texture profile analysis (TPA) has been used to characterize the foods studied. In all the above systems, there was a common observation that when the mean bubble diameter is smaller, the product becomes harder as evidenced by the increase in storage and loss modulus (G′, G″), whereas when the mean bubble diameter is large the product is softer with decrease in moduli values (G′, G″). Also, the bubble size distribution affects texture of foods. It was found that bread doughs with hydrocolloids (xanthan gum, alginate) aid a more uniform bubble size distribution. Bread baking experiments were done to study the rheological changes and mechanisms involved in the structural transition of dough to crumb. Steamed rice cakes with xanthan gum (XG) addition at 0.1% concentration resulted in lower hardness with a narrower pore size distribution and larger mean pore diameter. Thus, control of bubble size could be an important parameter defining final food texture.

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