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Unravel the structuring of meat analogues by neutron scattering

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The current unsustainable meat consumption makes a growing number of meat consumers turn to plant-based meat alternatives (PBMAs). To facilitate the transition towards a plant-based diet with its health and environmental benefits, the demand for an accurate reproduction of meat-like structure, texture and mouthfeel in PBMAs is pressing. High Moisture Extrusion Cooking (HMEC) is one of the methods to produce PBMAs. During HMEC, mixtures of plant proteins, dietary fiber and fat undergo heat- and flow-induced denaturation and subsequent plastification and texturization. The key to reproduce meat-like structures are the plastification and texturization which take place in a cooling die attached to the end of extruder. However, the "black-box" characteristics of the extrusion process make the understanding this process difficult. Small Angle Neutron Scattering (SANS) is a promising tool to unravel the mechanism of PBMA structurization. Here, we show the results of SANS measurements on different PBMA recipes, applying contrast variation to elucidate the role of the different components in the texturization of PBMAs. We also provide insight of in-situ SANS with a customized neutron-transparent cooling die. Crucially, this setup will help shed light on the plastification and texturization mechanism throughout the entire cooling process of extrusion. We expect to obtain a detailed insight into the structuring and thereby to pave the way towards a more sustainable nutrition.

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