# Characterization of Water Transport in Food Products from MRI Experiments

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As cabbage products contain components that contribute to the consumer's health, these products gained new attention. Cabbage products can be used as a fresh product but also in dried form. However, the components which contribute to the consumer's health are sensitive to the rising temperature during drying and may deteriorate. To predict and to optimize the content of these components, it is necessary to model the water and energy transport in these products as a function of time during drying.

For modelling diffusive transport, usually Fick's second law is applied. Hereby the diffusion coefficient is related to the temperature according the Arrhenius equation. During drying of food products water transport is affected by more aspects then temperature. The mobility of water depends on the how water is trapped in the network structure of the food composing components. The free volume theory takes the effect of the structure properties of food products on the effective diffusion coefficient into account. Therefore it gives a more accurate prediction of the mutual diffusivity of water molecules in food products over a large temperature and concentration range.

Based on the physical properties and the composition of broccoli the changes in the effective diffusion coefficient during drying are calculated with the free volume theory. For validation of the model the transport of water in the product must be monitored. For this purpose magnetic resonance imaging (MRI) is used. This pioneer technique allows the interior of food products to be imaged non-destructively.

From the raw MRI-data moisture profiles are obtained by imaging calibration samples of known moisture content. The effective diffusion coefficient is estimated from moisture profiles and the diffusion transport patterns are compared with simulation results.