

Title Beef meat electrical impedance spectroscopy and anisotropy sensing for non-invasive early assessment of meat ageing

Author Jean-Louis Damez, Sylvie Clerjon, Saïd Abouelkaram and Jacques Lepetit

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Abstract

The objective of this work was to study the electrical anisotropy behaviour of beef meat during maturation for the purpose of early assessment of meat ageing. Early assessment of beef meat fibre strength allows customised ageing of raw materials and optimisation of refrigerated storage times. During the maturation phase connection proteins break down, causing structural changes, fragmentation of myofibrils and degradation of the cytoskeleton. These modifications produce effects on the strongly anisotropic character of the muscle structure that can be observed using a sensor based on the emission of a polarised wave. For example, by tracking variations in impedance according to the angle between the electrical field direction and the main direction of fibres, a measurement of structural state, and thus of maturation state, can be obtained. In this study, two specific directions were used: along and across meat fibres. A simple method using a sensor with aligned electrodes was used to measure lineic impedances and study contact impedances as parameters of interest. A lineic impedance index was defined as the difference between lineic impedance across and along meat fibres. The lineic impedance index and the contact impedance were shown to be closely correlated to meat fibres strength. These two parameters can therefore be used to predict meat maturation state.