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MEASUREMENT OF THERMAL PROPERTIES OF RUBBERS DURING THE CURING PROCESS

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In industrial process of rubber part production, the moulded material undergoes a vulcanization reaction. During this step, the rubber part acquires its mechanical and structural properties. The comprehension and the control of this step are crucial for the product quality and the productivity optimisation. As the final curing state is a direct result of the thermal history on the moulded part, we showed, in last works, the possibilities of moulding process modelisation and optimisation by controlling the mould temperature in order to obtain a desired vulcanization level. However, for an accurate prediction and control of the curing cycles, one needs to have accurate values of the thermophysical properties of the studied material. In the literature, measurement of the thermal conductivity and the heat capacity of rubber are carried on with several techniques: steady-sate and transient heat transfer based techniques for the thermal conductivity and calorimetric techniques for the heat capacity. Even this measurement can be accurate, they don't provide reliable values of the thermophysical parameters which depend on the curing process parameters: temperature, pressure and vulcanization rate. In this work, we present, in the first part, the design and the manufacturing of an original experimental device allowing the simultaneous measurement of the thermal conductivity and the heat capacity of rubber compound during industrial rubber moulding process. The second part deals with the estimation model and the first measurements and parameters estimation results.