A NEW WAY OF DETERMINATION OF THE PARAMETERS OF THE CURE OF RUBBERS I.D.Rosca^a, R.Granger^b and J.M.Vergnaud^b

a- Department of Chemical Engineering, University Politechnica, Bucarest, Romania

b- Faculty of Sciences, University of St-Etienne, 42023, Saint-Etienne, France

Very often, the rate of cure of rubbers is expressed in terms of temperature through an Arrhenius' equation, and the parameters of interest are the activation energy and the pre-exponential factor, as well as the order of the overall reaction and the enthalpy. These parameters are useful for determining the operational conditions of the cure of a rubber sample whatever its shape and dimension^{1,2}. Two ways can be used for evaluating these parameters: the calorimetry which measures the heat flux obtained during the cure, and rheometers which measure the change in the viscosity. In this first method, the quality of the contact between the oven and the sample is far from being perfect; and in the second one, the heat transfer is not considered³.

A new method is established, based on the heat transfer through the sample by conduction and the heat generated by the overall cure reaction. It consists of recording the temperature as a function of time either at the mid-plane and on the surface of a rather thick sheet of rubber when heated in a mould, and of treating mathematically and numerically these two curves. Experiments have been made either with rubber samples having 2 and 20 % sulphur and the enthalpy of cure of 14 and 150 kJ/k. The results obtained with this method are similar as those determined by the rheometer when the enthalpy is low. When the rheometer cannot be used because of the too high enthalpy of cure, this method is highly sensitive. Thus, it can be said that this new method is of interest when the rheometers do not work properly.

1- J.M.Vergnaud and J.Bouzon, Cure of thermosetting resins, Springer-Verlag, London, 1992

2- K.Azaar, B.Lamine, R.Granger, I.D.Rosca and J.M.Vergnaud, Plastics, Rubber and Composites, 29(6), 253-257, 2000.

3- I.D.Rosca and J.M.Vergnaud, Plastics, Rubber and Composites, 30 (6), 275-281, 2001