

## Research of Thermal Stability of Aliphatic Alcohols and Their Aqueous Mixtures

Tamerlan Dzhapparov<sup>C, S</sup> and Akhmed Bazaev

*Institute of Geothermal Problems, Daghestan Scientific Center, Russian Academy of Science, Makhachkala,  
Daghestan, Russia*

*timur507@mal.ru*

The process of thermal decomposition of aliphatic alcohols (methanol, ethanol, 1-propanol and 1-butanol) and their aqueous mixtures in the range of temperatures 513.15 – 663.15 K was studied using the method of isothermal pressure increasing in a closed system. The starting temperatures ( $T_H$ ) of thermal decomposition (decomposition points) of dissolved in water alcohols are obtained. Values of  $T_H$  depending on composition ( $x$ ) and number of carbon atom ( $C$ ) are described by the polynomial equation  $T(x,C)=23.622x^2 - 65.617x + 6.378 * 10^{-3} C^2 + 28.826 * 10^{-2} + 544.258$ . It is shown that values of  $T_H$  decrease with increasing of alcohol concentration and increase with increasing of carbon atom. The rate of thermal decomposition of alcohol molecules depending on temperature, number of carbon atoms and concentration in water is evaluated. The changes of thermal coefficients (isothermal coefficient of compressibility  $\kappa_T$ , coefficient of cubical expansion  $\alpha$  and thermal coefficient of pressure  $\beta$ ), and main thermodynamic properties ( $C_v$ ,  $C_p$ ,  $H$ ,  $S$ ,  $U$ ,  $F$ ,  $G$ ) of studied mixtures depending on isothermal pressure increasing during the thermal decomposition of alcohols were calculated. To estimate rate of thermal decomposition of alcohols we used change of pressure of system in a unit of time at constant temperature and volume (closed system). Reaction rate constant was calculated by formula:  $k=1/p*dp/dt$  where  $k$  – reaction rate constant;  $p$  – pressure;  $\tau$  – time;  $dp/dt$  – rate of reaction. Values of kinetic and activation parameters of alcohol decomposition in the range of temperatures 583.15 – 663.15 K are estimated.