HOMOGENEOUS PYROLYSIS OF 2-METHYLPENTANE UNDER PULSED ADIABATIC COMPRESSION

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Abstract: Thermal decomposition of 2-methylpentane has been studied in a rapid compression machine over a temperature range of 700–1150 °C. The main products (ethylene, methane, propylene, hydrogen, isobutene, acetylene) and minor products of reaction have been determined. Some of them like vinylacetylene, cyclopentadiene, isoprene, benzene, toluene, and some other compounds were identified for the first time. Soot has not been found in products. It is shown that the increase of the pyrolysis temperature along with the decrease of the residence time brings to a growth of selectivity of the ethylene formation and to a fall of selectivity of methane, propylene, and isobutene formation. Increase of C_2–C_5 alkenes yields in 2-methylpentane pyrolysis compared to isopentane pyrolysis has been established.

Keywords: 2-methylpentane; 2-methylalkane; pyrolysis; rapid compression machine (RCM); alkenes; ethylene; isopentenes; isohexenes

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Figure Captions

Figure 1 Dependence of 2-methylpentane pyrolysis product yields on maximum compression ratio $\varepsilon_{\max}$. Identified compounds: *1* — ethylene; *2* — propylene; *3* — methane; *4* — acetylene; *5* — isobutene; *6* — 1,3-butadiene; *7* — ethane; *8* — hydrogen; *9* — benzene; *10* — but-1-ene; *11* — methylacetylene; *12* — sum of unidentified compounds; *13* — allene; *14* — propane; *15* — *trans*-pent-2-ene; *16* — 3-methylbut-1-ene; *17* — *cis*-pent-2-ene; *18* — cyclopentadiene; *19* — vinylacetylene; *20* — toluene; *21* — 2-methylbut-1-ene; *22* — isoprene; *23* — 2-methylbut-2-ene; *24* — pent-1-ene; *25* — sum of isohexenes (assumption); *26* — *trans*-but-2-ene; *27* — *cis*-but-2-ene; *28* — diacetylene; *29* — but-1-yne; *30* — sum of cyclohexane and methylcyclopentane; *31* — but-2-yne; *33* — *n*-butane; *34* — sum of linear isomers of hexene; *35* — isopentane; and *36* — *n*-pentane

Figure 2 Selectivity of 2-methylpentane pyrolysis products: *1*–*36* — refer Fig. 1

Figure 3 Total content of olefins C_2–C_5 (*1*) and C_2–C_4 (*2*) in the pyrolysis products of 2-methylpentane depending on maximum compression ratio $\varepsilon_{\max}$

Figure 4 Selectivity of the sum of olefins C_2–C_5 (*1*) and C_2–C_4 (*2*) in the pyrolysis products of 2-methylpentane

Figure 5 Deviation of H (*1*) and C (*2*) element content in 2-methylpentane pyrolysis products from the initial value in the initial mixture

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