TABLE	III.	PRESSUI	RE DROP	FOR 3/	82-INCH	SINGLE	HELIXES	IN
A COLL	JMN V	VITH 0.79	INCH IN:	SIDE D	IAMETER	AND 1	11 INCHES	OF
			PACKE	ED SEC	TION			

Rate of Boiling ^{n} Cc./hr.	Pressure Dro Mm. Hg.	p Rate of Boiling ^a $Cc./hr$.	Pressure Dro Mm. Hg	p
580 624 780 810	$11 \\ 14 \\ 21 \\ 19$	900 1000 1120 ^b	18 22 28	
^a Actual measur	red rate for a	n-heptane-methylcyclohexar	e mixtures	at

total reflux. ^b This rate is approaching flooding.

for one minute. This is a minimum value, since the takeoff tube did not catch all the condensate and some condensation took place below this tube.

The results (Tables I to III) are given in some detail so that the effect of preliminary wetting and other variables may be observed. To ensure constancy of operation, certain of the tests were conducted for as long as 36 hours. The wetting of the packing by flooding was accomplished by raising the still heat so that the rate of distillation was too great for the capacity of the column. As soon as the flood had subsided, by momentarily shutting off the still heat, the latter was set for the desired rate of distillation. The data in the tables represent consecutive time intervals of continuous operation except where otherwise noted.

These results show high efficiency combined with reasonable throughput and low-pressure drop per theoretical plate (approximately 0.3 mm. of mercury). The maximum measured rate of condensation in the 23.5-inch column was 1350 cc. per hour, and in the 111-inch column, 1260 cc. with n-heptanemethylcyclohexane mixtures. These figures correspond to 0.86 and 0.80 feet per second vapor velocity, respectively. The actual condensation rate is estimated to be 8 to 23 per cent greater.

With this packing, columns of the order of 100 theoretical plates can be built in a laboratory of average height. Such columns have the advantages of simple packed columns, including cheapness, ease of operation, simplicity of operation, ruggedness, and low pressure drop per theoretical plate.

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Isoöctane Production by Simultaneous Polymerization and Hydrogenation

V. N. IPATIEFF AND V. I. KOMAREWSKY

Universal Oil Products Company, Riverside, Ill.

ECENTLY a new simultaneous reaction, hydropolymerization, of olefinic hydrocarbons was described (3). This reaction takes place in the presence of mixed catalysts consisting of a combination of polymerizing and hydrogenating agents. In the presence of such mixed catalysts and hydrogen the simultaneous polymerization and hydrogenation of olefinic hydrocarbons take place, resulting in the formation of hydrogenated polymers; this reaction was therefore called "hydropolymerization." In the study of different catalysts adaptable for this reaction particular attention was given to phosphoric acid, because of its successful use in the polymerization of olefins (2) and the development of the industrial process of catalytic polymerization of cracked gases (1). The most interesting and important hydrocarbon submitted to hydropolymerization was isobutylene.

By hydropolymerizing isobutylene in the presence of a solid phosphoric acid-nickel oxide-iron catalyst under hydrogen pressure, it was possible to obtain direct a mixture of isomeric octanes.

The experiments were conducted in a steel rotating autoclave, 1 liter in capacity. The catalyst and the liquid isobutylene were weighed in a steel liner which was afterwards placed in the autoclave.

In each experiment 80 kg. per sq. cm. of hydrogen were used. The liquid products of the experiment were fractionated through a Podbielniak column. The gases were analyzed by a combined Göckel and Podbielniak method.

Isobutylene was obtained by catalytic dehydration of isobutyl alcohol over an alumina catalyst at 350° C. The catalyst was prepared by mixing 1.5 parts of solid phosphoric acid catalyst (1) with 1 part of reduced iron and 0.5 part of nickeloxide. Twenty grams of this mixed catalyst were used in each experiment. The following table represents the results of two experiments:

Expt. 1	CAPU Z	
250	300	
12	6	
108.7	117.0	
100.0	112.5	
92	96	
36	35	
	$\begin{array}{c} 250\\12\\108.7\\100.0\\92\\36\end{array}$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$

The results of the investigation of the product of each experiment are as follows:

	Expt. 1	Expt. 2
Unsatd. content of product, %"	10	θ,
% of total liquid product Octane No. of octane fraction	46 83 ^b	56 84
Gases from the reaction, %: Hydrogen Butane	95.8 4.2	95 5.0

^a Determined by sulfuric acid method. ^b The fraction of this product boiling at 100-110° C, had an octane number of 100. The comparatively low octane number (83) of the total octane cut is probably due to the formation of isomeric octanes other than 2,2,4-trimethylpentane.

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