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PRODUCTION OF NAPHTHALENE

Alexander N. Sachanen and Alfred W. Francis,
Woodbury, N. J., assignors to Socony-Vacuum
Oil Company, Incorporated, New York, N. Y.,
a corporation of New York

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This invention relates to the production of naphthalene. More particularly, the invention relates to the production of naphthalene from alkyl naphthalenes.

5 It is known that various processes yield alkyl naphthalenes as a part of their product. For instance, in certain cracking operations as, for example, selective cracking of refractory recycle stocks, there may be formed an appreciable
10 amount of alkyl naphthalenes. Moreover, certain catalytic dealkylation processes as, for instance, the dealkylation processes described in the copending applications Serial No. 227,977, filed September 1, 1938, and Serial No. 234,012, filed October 8,
15 1938, may yield substantial amounts of alkyl naphthalenes even up to 25% or more in some cases. Further, alkyl naphthalenes may occur naturally in products such as coal tar. In view of these and other potential and actual sources of
20 alkyl naphthalenes, the utilization of these compounds is of increasing importance.

In the past, it appears that little work has been done on the conversion of alkyl naphthalenes to naphthalene. The reason for this is
25 probably due to the heretofore scarcity of the former compound and the availability of naphthalene. The proposed prior processes for producing naphthalene from alkyl naphthalenes partake of non-catalytic reactions at high tem-
30 peratures of the order of "bright red" (about 850° C. to 950° C.). There also have been suggested processes for treating products containing alkyl naphthalenes whereby the alkyl naphthalenes were reduced to benzene and toluene. How-
35 ever, so far as we are aware no one has touched upon the particular process which we have discovered as being so highly effective for converting alkyl naphthalenes to naphthalene.

It is an object of this invention to provide an
40 efficient process for converting alkyl naphthalenes to naphthalene.

Another object of this invention is to provide an efficient process for producing relatively high yields of naphthalene from alkyl naphthalenes
45 in an economical and rapid manner.

The invention is based upon the discovery that alkyl naphthalenes are dealkylated to give relatively high yields of naphthalene when the reaction is carried out at high temperatures of the
50 nature herein disclosed and in the presence of a clay-type catalyst. For instance, we have discovered that when the alkyl naphthalenes are treated at temperatures between about 450° C. and about 650° C. and in the presence of a clay-
55 type catalyst, complete dealkylation of a portion

of the alkyl naphthalenes occurs to an optimum degree thereby giving relatively large yields of pure naphthalene.

The alkyl naphthalenes used in our process may be derived from any suitable source. For instance, they may be obtained as one of the products of certain reactions, such as selective cracking processes or dealkylation processes of the nature of those disclosed in the two copending applications hereinbefore mentioned or they may be obtained from any other available supply such as coal tar and the like.

The catalysts with which our invention is concerned are those which are commonly designated as clay-type. In addition to the various clays themselves and the various activated clays, there are numerous other porous refractory adsorptive materials of a neutral character which may be used and come under the common designation of clay-type catalysts, for example, fuller's earth, pumice and granular diatomaceous earth. Furthermore, it is to be understood that these various clay-type catalysts which have other suitable catalytic materials impregnated therein or thereon or otherwise conjoined for service may also be used.

Since the reactions involved in our process bring about a gradual poisoning or deterioration of the catalyst, it is well to use a clay or other similar catalyst which is possessed of a sufficiently refractory nature, so that it may be regenerated in situ by burning or other suitable means. In fact, some of the clay catalysts used by us have been regenerated a great number of times and are still quite satisfactory. One effective means of regenerating spent and inactive clay catalysts comprises oxidizing the spent and inactive clay with air at a temperature of about 500° C. Because of the ease with which the clay-type catalysts may be regenerated, they lend themselves to economical operation. It is also well to use the clay or other similar catalyst in the form of particles of such physical nature with respect to size and dimension that they may be effectively packed together in a catalytic mass and yet, at the same time, present a sufficient cross-sectional area of flow that the reactants may have a ready passage therethrough as well as a suitable exposure of catalytic material to reactants. A convenient and efficient form for the catalyst is small granules, rods or cylinders.

The temperature employed in our process should be maintained between about 450° C. and about 650° C. In the preferred embodiment of the invention, the temperature is maintained in

the neighborhood of 500° C. For instance, a temperature of about 520° C. has given excellent results.

In the preferred manner of carrying out the invention vapors of alkyl naphthalenes are passed continuously through a tube containing activated clay catalyst and maintained at suitable temperature in the range herein disclosed and under substantially atmospheric pressure. As a result a part of the alkyl naphthalenes is converted into naphthalene. After removal of the naphthalene formed, the unchanged product may be recycled and processed again. Batch operation and super-atmospheric pressure may be used; however, in general, the results are not so favorable as those given by the preferred operation. Moreover, benzene may be added, if desired, to aid in the dealkylation of the alkyl naphthalenes.

The following examples are given in order to more clearly illustrate the invention. However, it is to be understood that they do not limit the invention as there may be variations therefrom without departing from the spirit of the invention.

Example I.—50 parts by weight of alpha methyl naphthalene are passed through an iron pipe filled with clay catalyst and maintained at a temperature of 521° C. The reaction time is seven minutes. 16 parts by weight of naphthalene are obtained.

Example II.—50 parts by weight of beta methyl naphthalene are reacted under the same conditions of Example I. A yield of 22 parts by weight of naphthalene is obtained.

Example III.—47 parts by weight of an alkyl naphthalene fraction boiling between 236 to 249° C. are passed through an iron tube containing clay catalyst and maintained at a temperature of 521° C. The reaction time is nine minutes. A yield of 12 parts by weight of naphthalene is obtained.

In each of the three above examples, the yields of naphthalene are given per pass of alkyl naphthalenes through the reaction chamber. In addition to the naphthalene formed, some liquid products are obtained which comprise mainly unchanged alkyl naphthalenes. The final yield of naphthalene may be increased by recycling these recovered alkyl naphthalenes.

We claim:

1. A process for producing naphthalene from alkyl naphthalenes which comprises subjecting vapors of the alkyl naphthalenes to a dealkylation treatment by passing said vapors in a continuous manner through a confined zone in contact with an activated clay catalyst at a tem-

perature of about 520° C., separating naphthalene formed in the treated vapors from the alkyl naphthalenes not completely dealkylated and recycling these latter alkyl naphthalenes to said dealkylation treatment.

2. A process for producing naphthalene from alkyl naphthalenes which comprises subjecting vapors of the alkyl naphthalenes to a dealkylation treatment by passing said vapors in a continuous manner through a confined zone in contact with a catalyst comprising an association of silicon oxide and aluminum oxide at a temperature between about 450° C. and about 650° C., separating naphthalene formed in the treated vapors from the alkyl naphthalenes not completely dealkylated and recycling these latter alkyl naphthalenes to said dealkylation treatment.

3. A process for producing naphthalene from alkyl naphthalenes which comprises passing the alkyl naphthalenes in contact with an activated clay catalyst at a temperature of about 520° C.

4. A process for producing naphthalene from alkyl naphthalenes which comprises passing the alkyl naphthalenes in contact with an activated clay catalyst at a temperature in the neighborhood of 500° C.

5. A process for producing naphthalene from alkyl naphthalenes which comprises passing the alkyl naphthalenes in contact with an activated clay catalyst at a temperature between about 450° C. and about 650° C.

6. A process for producing naphthalene from alkyl naphthalenes which comprises contacting the alkyl naphthalenes with a catalyst comprising an association of silicon oxide and aluminum oxide at a temperature in the neighborhood of 500° C.

7. A process for producing naphthalene from alkyl naphthalenes which comprises contacting the alkyl naphthalenes with a catalyst comprising an association of silicon oxide and aluminum oxide at a temperature between about 450° C. and about 650° C.

8. A process for producing naphthalene from alkyl naphthalenes which comprises contacting the alkyl naphthalenes with a clay catalyst at a temperature in the neighborhood of 500° C.

9. A process for producing naphthalene from alkyl naphthalenes which comprises contacting the alkyl naphthalenes with a clay catalyst at a temperature between about 450° C. and about 650° C.

ALEXANDER N. SACHANEN.
ALFRED W. FRANCIS.