

Activated Carbons

Use of These Modern Decolorizing Agents Seen as an Aid to Stability of Edible Oils

By JOHN P. HARRIS and E. A. SIGWORTH

EVERY year the edible oil refiner becomes increasingly interested in the stability of his oil. To meet the demands of the baker and of other quality trade, he must produce a decolorized refined oil free from trace of soap or colloidal impurities; he must deodorize at such temperatures as will assure quick elimination of the fatty bodies which contain the objectionable flavors and odors, and throughout all of his processing he must guard carefully against inclusion of oxygen.

Looking back two or three decades, we find that the processing of shortening was agreeably simple for the refiner. He neutralized his oil with sodium hydroxide solution, settled out most of the soap stock from the oil which he decanted from the foots in his neutralizing kettle; added fullers' earth at high temperatures, under almost any old kind of agitation, filtered, blew with steam, mixed his deodorized oil with 15 to 20% of nearly water white oleo stearine and ran the mixture over the lard roll into packages. A nice uniform shortening. Mighty little to worry about. No one around to bedevil him about thousandths of a percent of free fatty acids and about inclusion of oxygen and elimination of a trace of soap in the oil, (maybe that trace of soap was a subject for self-congratulation, being referred to as a "sweet nutty flavor"). "Them" were the happy days of oil refining.

Even the matter of plant yields was a snap. Gross weight packages insured a shipping return well above 100%. Oil was cheap and no one bothered much about converting into net figures. But alas! alack! Today the years have brought us hydrogenation, both partial and complete (with a lot of intermediates). The consumer has been educated to demand low hundredths of a percent in free fatty acids, complete absence of soap and colloidal impurities and exclusion of oxygen, to say nothing of net weight packages.

Pity the poor oil refiner; his path is beset with pitfalls. From the time he decants his refined oil from the neutralizing kettle, there is an enemy lurking in every tank, pump and agitator to destroy him. The amazing ability

of free fatty acids to multiply in every division of processing has even the family habits of the guinea pig beaten to a whisper. The affinity of his oil for the oxygen of the air is astounding and increases rapidly as the temperature rises. Even our old friend, fullers' earth, which has helped us whiten for generations, assumes a Machiavellian role when it promotes the inclusion of oxygen while being mixed with oil in the decolorizing kettle. It appears that the decolorizing effect of fullers' earth is directly due to adsorption of color, without any consideration of oxidation, (as proven by the fact that very good decolorizing action takes place when air is excluded), but it appears that, in ordinary decolorizing operations where edible fats are agitated mechanically in the presence of air at temperatures above 160° F., the fullers' earth does actually act in a measure as a catalyst for consequent inclusion of air, such inclusion resulting in reduced stability.

Vacuum bleaching, (when absolutely airtight vessels are used), tends to minimize this, undoubtedly as is the case when completely tight vacuum deodorizing vessels are used. Reduction of temperature also minimizes oxidation, but most fullers' earth declines rapidly in decolorizing ability as the temperature is reduced. The writers believe that the adverse color as well as flavor effect of oxidation, while decolorizing, often defeats the very purpose for which the refiner is striving. Fortunately activated carbons, especially those of highly adsorptive structure and particularly those whose high activity is not induced by treatment with chemicals, decolorize at very low temperatures and, even at higher temperatures, appear to exert a minimum degree of catalytic influence leading to the inclusion of oxygen; in fact some of the best carbons exert a strong reducing effect, which may result in defeating oxidation and may possibly reduce the percentage of oxygen included by volume. Therefore, they may be very profitably employed in decolorizing.

Recent tests also show that such carbons possess a very strong ability to adsorb and

(Turn to Page 195)

Activated Carbons

(From Page 173)

retain traces of soap in refined oil, as evidenced by the following tests on refined coconut oil of a known soluble soap content (indicated as sodium oleate).

	Percent Soluble Soap (estimated as sodium oleate)
Refined coconut oil	0.0152%
Same coconut oil decolorized with 1% of imported activated carbon A	none
Same coconut oil decolorized with 1% of domestic activated carbon X	none
Same coconut oil decolorized with 1% of domestic carbon Y	0.0030%
Same coconut oil decolorized with 1% of imported activated carbon B	0.0046%
Same coconut oil decolorized with 1% of imported activated carbon C	0.0055%

Thus it may be seen that all of the five samples of activated carbon used exerted a strong effect of soluble soap reduction, two of the five completely eliminating any final trace of soap in the oil, while the minimum reduction was 0.0097% out of 0.0152%.

The use then of as large a percentage of activated carbon as profitably may be employed from a decolorizing standpoint, and the reduction of decolorizing temperatures to a minimum, would appear to assist the edible oil refiner, especially if he is not properly equipped for vacuum decolorizing. Apparently the presence of such carbon in decolorizing tends to aid in the complete elimination of those objectionable traces of soaps and other impurities, dissolved or held in colloidal suspension in the oil.

Smalley Foundation

(From Page 187)

Tables IV—Results of Other Collaborators Whose Results Deserve Recognition

Anal'yst	No. samples reported on	Points off	
		Oil	Ammonia
6	29	—	28
18	23	—	42
25	29	—	63
32	29	30	34
37	26	447	66
45	27	—	51
60	23	247	70
63	29	47	7
65	26	187	36
73	23	88	59
75	29	—	115
82	29	—	93
87	20	140	36
89	28	315	100
90	28	497	196
92	29	143	96
93	26-27	503	62
97	21-24	380	154

Table V
Showing Degree of Uniformity of Results Reported

	report- ing	No. ± .10	No. ± .05	No. ± .02	Sample No.
OIL					
Max. deg.	55	49	39	20	29
Min. "	55	38	24	16	23
Aver. "	54	44	34	18	—
AMMONIA					
Max. deg.	89	88	79	47	23
Min. "	90	81	69	39	2
Aver. "	88	85	73	43	—

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Statement of the ownership, management, circulation, etc., required by Act of Congress of August 24, 1912, of Oil & Fat Industries, published monthly at New York, N. Y. for April 1, 1930.

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Before me, a Notary Public in and for the State and county aforesaid, personally appeared Alan Porter Lee, who having been duly sworn according to law, deposes and says that he is the Editor of the Oil and Fat Industries and the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation) etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

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Sworn to and subscribed before me this 18th day of March, 1930.

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