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PROCESS FOR REFINING AND IMPROVING FATS AND SIMULTANEOUSLY SEPARATING THE ACCOMPANYING SUBSTANCES THEREFROM

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The invention relates to a process for refining fats in which valuable accompanying substances may be recovered and employed again.

As is known, natural fats contain in addition to the fatty acid glycerides, colouring substances, phosphatides, vitamins mucous substances and the like. Only in isolated cases, for example in the production of lecithin from soya beans, are these accompanying substances technically utilised to some extent. In most refining and bleaching methods, the accompanying substances are lost. Recent research has shown that such compounds are valuable as "accessory" nutritive substances, for example vitamins and hormones. Moreover, their presence may delay the deterioration of the fats, so that they are natural protective substances.

The refining of fats by the hitherto usual methods therefore cannot always be regarded as expedient. However, there are cases in which the removal of the aforesaid accompanying substances is necessary. This applies, for example, to the hardening of the fats for the purpose of sparing the catalyst. Moreover, the accompanying substances are frequently involuntarily removed together with free acids, products of decomposition and the like. In the case of deteriorated fats, the main value must be placed on the removal of disturbing odorous or flavouring substances. The present process consists in refining fats in such a manner, that the accessory accompanying substances are removed in a sparing manner in order that they may again be utilised and if necessary again added to the starting material, either directly or after hardening thereof. Furthermore, when carried out in a certain manner it may also serve for recovering secondarily formed compounds, for example products of decomposition.

The "chromatographic adsorption analysis" permits of separating the colouring substances, sterins and the like by reason of the affinity thereof for certain substances active in lowering surface tension (alumina, carbon, bleaching earths, calcium carbonate and the like). However, this method has hitherto only been of value for purposes of analysis and dissection, although it has already been known for many years. Whenever fats were used for such scientific experiments one was not interested in the fats as such. The present process is based on the fact that adsorption phenomena of this type may also be utilised for the technical refining of fats with the simultaneous removal and further use of the accompanying substances.

The use of substances active in lowering surface tension for the purpose of binding colouring substances, mucous substances and the like is known per se in the technical working up of fat. For this purpose, a large amount of fat is taken to a small quantity of adsorption medium, thorough stirring is carried out and the adsorption is assisted by heating. Adsorption media are particularly popular which can set up chemical reactions by preliminary treatment, for example by small adhering quantities of acids and acid substances or substances having a coagulating action. The adsorbate is in such cases subjected to a more or less extensive decomposition, which can be recognised by the dark colouring of the used-up refining medium.

In the present process, the fat to be treated comes into contact with much larger quantities of the adsorption medium. It is passed, either undissolved or dissolved in solvents, continuously or discontinuously through the adsorption medium, chemical modifications being avoided. The flow of the fat or of its solution may be accelerated by vacuum or pressure. If substances sensitive to air are present, the process may be carried out in the presence of inert gases. Benzine, trichloroethylene and benzene may, for example, be employed as solvents for the fats. The adsorption takes place in dependence upon the surface forces of the accompanying substances to be removed. It is known from the "chromatogrammes" employed for analytical purposes that colouring substances have a very considerable affinity for adsorbents. This is true, for example, of the physiologically active substances of the nature of vitamin A which accompany fats.

It is not difficult to dissolve out the adsorbate from the adsorption medium. For this purpose, suitable solvents are employed. If solutions of the fats are subjected to adsorption, the same solvents may be employed. A change of solvents frequently brings about the desired result more rapidly. After dissolving out, the adsorption medium is available for further use, until it must finally be reactivated by special methods.

The treatment described is very sparing and entails no losses. The fats are obtained in a very pure form and the accessory accompanying substances retain their activity. They may be separately employed, for example, for therapeutical or dietetical purposes, or they may again be added to the fat after any desired conversion thereof, for example after hardening for the production of margarine. If they are rendered impure, for example by disturbing flavouring and

odorous substances, as in the case of rancid fats, purification is previously carried out, for example removal of aldehydes by disulphite solution, if the deterioration of the fat in question has not advanced too far.

In an earlier application I have described a process in which fats and fatty acids of any desired nature or mixtures thereof are separated in a similar manner. It may therefore occur that in the adsorption of the accompanying substances the actual fat constituents are also taken up, for example that fatty acids are adsorbed together with accompanying substances of the fats. However, it is also possible here to obtain satisfactory results by suitable selection of the adsorbent, the quantity thereof, the temperature and if necessary the solvents. The selective adsorption of the glycerides of the fatty acids is the most difficult to effect. Therefore, it is simple to free a neutral fat from the accompanying substances by the process according to the present application. It is generally also immaterial in the further use of the accompanying substances whether they still contain a part of the fat or glyceride fractions thereof.

If it is desired to free solutions of the fats from accompanying substances and if the former are isolated by extraction, the miscellany may be directly employed in the meaning of the present process. They are first made to flow through smaller quantities of the adsorbent for the purpose of removing suspended substances, and batteries of adsorption devices are then connected preferably in towers. The free acids and the like may then also be removed in addition to the accompanying substances. While, for example, the solvent has hitherto first been removed in the production of soya oil, the accompanying substances have been coagulated by water vapour and the lecithin thus produced has been employed for the manufacture of margarine, in the present process the phosphatides and the like are adsorbed from the miscellany and are dissolved out of the adsorbent. In the case of oils containing valuable curative substances, this sparing enrichment is particularly desirable, for example in the case of train oils.

The manner in which the process is carried out will be readily understood from the foregoing description. For example, crude linseed oil is made to flow slowly through coarsely granulated aluminium oxide which is situated in an adsorption tower. The filtrate is practically free from colouring substances and other accompanying substances. The oil still present in the adsorption medium may be dissolved out with a suitable solvent and contains the accompanying substances in strongly enriched form after the removal of this solvent. If solutions of fats are employed, the adsorption medium may first be carefully treated with the same solvent in the pure state and the greater part of the oil thus removed. Not until then are the adsorbed constituents dissolved out.

It is also possible to combine the present process in various manners with known refining and improving methods.

The known adsorbents, such as alumina, bleaching earths, carbon, gypsum, calcium carbonate, magnesium oxide, fibrous clay and other inorganic or organic substances may be employed in the process according to the invention.

Examples

1. A whale oil, the vitamin A content of which is shown by a strongly blue Carr-Price reaction, is filtered through granulated silica gel. No free vitamin A can be traced in the filtrate, while a considerable improvement in smell can be observed therein.

2. Lagos palm oil is dissolved in 5.0 parts of carbon disulphide and the solution is slowly filtered through 5 parts of fuller's earth. Two washing operations are then carried out, each with 5 parts of carbon disulphide. Practically all the fat passes into the filtrate and remains behind with a light yellow colour after removal of the solvent by distillation. The acid is then extracted with acetone and a deep red solution in the majority of carotenes is obtained.

A soya miscellany can be worked up to lecithin and sterins by adsorption. Both are fixed by adsorption. Experiments with pure lecithin show that it is particularly well adsorbed from benzine solution. The miscellany employed consisted of benzine having the boiling point 70° and contained about 30% oil. The final point of the adsorption of lecithin is best recognised from the fact that the filtrate with acetone added thereto becomes turbid as soon as lecithin is formed. The latter is well adsorbed by silica gel, aluminium oxide, fuller's earth and the like. Calcium lacticum, calcium citricum and magnesium oxide may also be employed. Thus, 3 parts of magnesium oxide may take up about 0.25 part of lecithin under suitable conditions. The aforesaid miscellany yielded about 1% lecithin and sterin to the adsorbent.

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