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TREATMENT OF ASPHALT

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This invention relates more particularly to the treatment of residual petroleum asphalts produced by the reduction of either straight run or cracked residua.

In a more specific sense the invention is concerned with a process for preserving the properties of such asphalts during their handling and storage.

The exact chemical constitution of the mixtures of compounds which go to make up artificial and natural asphalts is difficult to determine on account of their high molecular weight and complexity and the ease with which they are decomposed on heating. Consequently the average composition is only approximated by the determination of their ultimate composition, their reactivity with chemical reagents such as sulphuric and halogen acids and their solubility in miscellaneous solvents. The net results of a large mass of experimental work done along these lines has established the fact that most asphalts contain relatively large percentages of unsaturated straight chain and cyclic hydrocarbons (the latter predominating), and numerous oxygen, nitrogen and sulphur derivatives thereof. The artificial asphalts, in contrast to those occurring as mineral deposits, are characterized generally by higher percentages of unsaturated and more or less polymerizable hydrocarbon compounds. Thus, during the handling of such materials when they are mixed with siliceous aggregates to form composites for road use and for other purposes, there is a considerable tendency for deterioration in properties to occur depending to some extent upon the exact nature of the unsaturated compounds, the temperatures employed and the degree of exposure to air. The extent of change in properties is frequently considerable and is manifested in the development of brittleness and increase in melting point so that the resiliency of the road aggregate is less and the road is consequently subject to more rapid deterioration due to abrasive and weathering influences.

Even after an asphalt has been placed in service either in a road, in asphalt shingles or in paint films, etc., it is frequently still further subject to deterioration even at ordinary atmospheric temperatures due to the gradual oxidizing action of the air, the effect of wind and rain and alternate raising and lowering of temperatures.

In one specific embodiment the present invention comprises treatment of residual petroleum asphalts with small amounts of wood tar pitches to retard their deterioration during handling and in service.

I have determined that, by the use of relatively small percentages of wood tar pitches in asphalts, the rate of deterioration may be substantially retarded. The reason for this inhibiting action may be assumed to be due to the preferential affinity of the wood tar pitch for oxygen which is apparently the active agent in inducing the series of reactions leading ultimately to the formation from the asphaltic materials of polymers and derivatives which have less ductility and higher melting point. It will be evident to those familiar with the known properties of asphalts on the one hand and wood tar pitches on the other that the exact course of the various chemical reactions involved in either the normal or the retarded polymerization would be difficult, if not impossible, of determination. For this reason the novel and unexpected results obtained by the use of small percentages of wood tar pitch in petroleum asphalts would not have been readily predictable.

The wood tar pitches which have been found to be most efficient in the present connection are those produced as a residue in the vacuum distillation of settled hardwood tars. By the use of a considerable vacuum of the order of 5 to 10 mm. of mercury absolute, the decomposition of the pitch compounds is kept at a low figure and they function more efficiently as inhibitors. When the tar distillation is conducted carelessly or even with relatively large amounts of steam at atmospheric pressure, sufficient decomposition of the active inhibiting principles occurs to markedly depreciate the inhibiting value of the pitch as a whole.

The character of the compounds which are responsible for the inhibiting value of wood tar pitches is obscure and no attempt will be made to explain their action upon a strictly chemical basis, reliance being based rather upon the uniformly good results obtained by their use.

In practice amounts of pitch of from 0.5 to approximately 5.0% may be added to different asphalts, depending upon their tendency toward oxidation and deterioration during handling and in service. The pitch may be added to the molten asphalt at any point during its production manipulation or storage. As a rule no difficulty will be encountered in obtaining a good distribution throughout the body of asphalt and it is not necessary to melt the pitch if mechanical agitation or circulation is provided. It is frequently of advantage, however, to add the inhibiting material to the freshly prepared asphaltic residues, since these appear to be specially sensitive

to deteriorating influences and if the polymerizing and other reactions are permitted to begin it is more difficult to arrest their further progress so that in such cases involving partly deteriorated asphalts larger amounts of wood tar pitch may be necessary to prevent further loss in desirable properties.

Examples of the practical application of the present process for stabilizing asphalts subjected to too rapid deterioration during handling and service are numerous but the following will serve to illustrate the beneficial character of the results obtained in one case.

A California asphalt produced as a residue in the straight run distillation of petroleum had the physical characteristics shown in column 1 of the table when freshly prepared. Column 2 shows the corresponding properties after the same asphalt had been maintained at a temperature of about 500° F., in a small portable storage tank and then mixed with the proportioned aggregate to give a material for road construction. Column 3 shows the properties after the heating and mixing period when 2% by volume of a wood tar pitch was added to the asphalt as it was being run from the stills in which it was produced.

Properties of asphalt

	1	2	3
Penetration at 32° F., 200 g. 60"----	8	7	8
Penetration at 77° F., 100 g. 5"----	40	32	39
Penetration at 110° F., 50 g. 5"----	275	220	270
Ductility at 77° F----	150 cm.	100 cm.	150 cm.
Melting point—ball and ring method.	135° F.	150° F.	138° F.
Solubility in CCl_4----	99.8%	99.0%	99.75%
Solubility in 86 A. P. I. paraffin naphtha----	85%	80%	84.5%

The effectiveness of the wood tar pitch in preventing deterioration during handling is readily seen from the above data. It is further observable from long time tests of inhibited and uninhibited material when used in roads that there is less tendency to checking, spalling and surface dusting in the inhibited material than in the uninhibited.

The foregoing specification shows the character of the invention and the single numerical example is illustrative of results which may be obtained by its use but neither is to be construed in the light of imposing limitations upon its generally broad scope.

I claim as my invention:

1. A process for the treatment of asphalt to prevent oxidation and deterioration of the same, which comprises adding thereto between 0.1% and 5.0% of wood tar pitch.

2. A process for the treatment of asphalt from petroleum to prevent oxidation and deterioration of the same, which comprises adding thereto between 0.1% and 5.0% of wood tar pitch.

3. A process for the treatment of asphalt to prevent oxidation and deterioration of the same, which comprises adding thereto between 0.1% and 5.0% of wood tar pitch derived from the distillation of wood tar under vacuum.

4. A process for the treatment of asphalt from petroleum to prevent oxidation and deterioration of the same, which comprises adding thereto between 0.1% and 5.0% of wood tar pitch derived from the distillation of wood tar under vacuum.

5. A process for the treatment of asphalt to prevent oxidation and deterioration of the same, which comprises adding thereto between 0.1% and 5.0% of a pitch derived from the distillation of hard wood tar.

6. A process for the treatment of asphalt to prevent oxidation and deterioration of the same, which comprises adding thereto between 0.1% and 5.0% of a pitch derived from the distillation of hard wood tar under vacuum.

7. Asphalt inhibited against oxidation and deterioration by the addition thereto of between 0.1% and 5.0% of wood tar pitch.

8. Asphalt inhibited against oxidation and deterioration by the addition thereto of between 0.1% and 5.0% of hard wood tar pitch.

9. Asphalt inhibited against oxidation and deterioration by the addition thereto of between 0.1% and 5.0% of wood tar pitch derived from the distillation of wood tar under vacuum.

10. Asphalt inhibited against oxidation and deterioration by the addition thereto of between 0.1% and 5.0% of wood tar pitch derived from the distillation of hard wood tar under vacuum.

11. Asphalt from petroleum inhibited against oxidation and deterioration by the addition thereto of between 0.1% and 5.0% of wood tar pitch.

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