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HIGH MOLECULAR WEIGHT ALKENYL-N-PARA AMINO-PHENYL SUCCINIMIDE

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This invention relates to oil-soluble nitrogen-containing compositions and to the process of preparing the same. The compositions of this invention are useful as dispersing agents in lubricants, especially lubricants intended for use in the crankcase of internal combustion engines, gears, and power transmitting units.

One of the principal problems associated with present day crankcase lubricants is that posed by the inevitable presence in the lubricant of foreign particles such as dirt, soot, water and decomposition products resulting from breakdown of the lubricating oil. Even if there were none of this latter contaminant present the very nature of the design of the modern internal combustion engine is such that a significant amount of foreign matter will accumulate in the crankcase. Perhaps the most important of these contaminants is water because it seems to be responsible for the deposition of a mayonnaise-like sludge. It appears that if there were no water present the solid components of the mayonnaise-like sludge would circulate with the oil and be removed by the oil filter. It will be readily appreciated that the deposition of the sludge presents a serious problem with respect to the efficient operation of the engine and that it is desirable to prevent such deposition of sludge-like material.

The presence of water and the precursors of sludge in a lubricating oil is dependent largely upon the operating temperature of the oil. If the oil is operated at a high temperature the water, of course, will be eliminated by evaporation about as fast as it accumulates. In the absence of water as stated above the other foreign particles will be removed by the filter. At low oil temperatures, on the other hand, water will accumulate and so consequently will sludge. It is apparent that the environment in which a crank case lubricant is maintained will determine to a large extent the ultimate performance of that lubricant.

High operating temperatures are characteristic of a lubricant in an engine that is run at relatively constant high speed. Thus, in an engine that is run at 60 miles per hour for a long period of time it is very unlikely that there will be any accumulation of water and it is similarly unlikely that there will be any formation and deposition of sludge, but in ordinary stop-and-go driving, the crankcase lubricant will be alternately hot and cold, an ideal environment for the accumulation of water. In such cases the formation of sludge is a serious problem. This problem has been with the automotive industry for many years and its solution has been approached by the use of known detergents such as metal phenates and sulfonates but without notable success. Although such known detergents are very effective in solving the detergency problems associated with motor oils at high temperatures they have not been particularly effective in solving the problems associated with low temperature operation, or to put it better, those problems which are associated with crank-case lubricants in engines which are operated at alternating high and low temperatures.

It is accordingly a principal object of this invention to provide novel compositions of matter.

It is also an object of this invention to provide compositions which are adapted for use as additives in hydrocarbon oils.

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It is also an object of this invention to provide compositions which are effective as detergents in lubricating compositions.

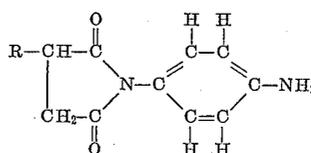
It is another object of this invention to provide a novel process for the preparation of products which are effective as dispersants in lubricant compositions.

It is another object of this invention to provide novel compositions which are effective dispersants in lubricant compositions intended for use in engines operated at alternating high and low temperatures.

It is another object of this invention to provide improved hydrocarbon oil compositions.

It is another object of this invention to provide improved lubricating compositions.

These and other objects are achieved in accordance with this invention by providing a succinimide having the structural formula



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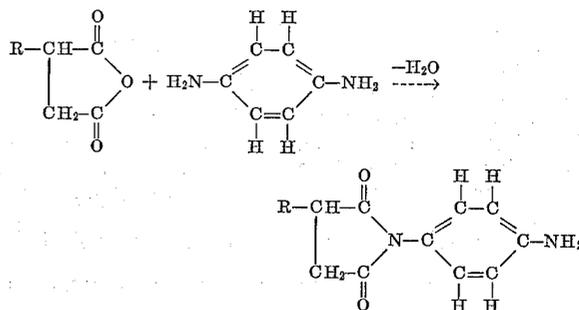
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wherein R is a polyisobutene radical having from about 50 to about 200 carbon atoms.

A critical aspect of this invention is that the polyisobutene radical contains at least about 50 carbon atoms. The criticality is predicated upon the discovery that a similar succinimide having a smaller R radical in its molecular structure is not useful for the purposes of this invention.

The sources of the R radical include polyisobutenes having molecular weights within the range from about 700 to about 3000. Such polymers are well known in the art. They can be obtained for instance, by contacting isobutene, preferably in a solvent such as hexane, butane, or naphtha, with a Friedel-Crafts catalyst such as aluminum chloride, boron trifluoride, zinc chloride, or titanium tetrachloride at a temperature between about -50° C. and 25° C.

The polyisobutene-substituted succinimide of this invention is obtained by the reaction of approximately equimolar mixtures of an appropriate polyisobutene-substituted succinic anhydride or acid with p-phenylene diamine. The reaction between an anhydride and the diamine is illustrated by the following equation:



The reaction should be carried out at a temperature which is sufficiently high to cause the removal of water from the reaction mixture. Ordinarily the temperature is between about 100° C. and 250° C., preferably between about 150° C. and 200° C. The presence of a solvent during the reaction is often advantageous to facilitate mixing of the reactants and control of the reaction temperature. Solvents useful herein include mineral oil, xylene, diphenyl oxide, and dodecane.

The polyisobutene substituted succinic acids or anhydrides which are contemplated as a reactant in the above

