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PROCESS FOR THE PRODUCTION OF ARTIFICIAL FILAMENTS, FIBERS AND FOILS

Johannes Kleine, Dessau, Germany; vested in the Alien Property Custodian

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This invention relates to new compositions of matter and more particularly to long-chained paraffins and filaments, fibers, foils, films and the like prepared therefrom.

It is known to prepare paraffins by hydrogenation of carbon monoxide. Also by direct hydrogenation of coal or coal-hydrocarbon mixtures it is possible to obtain paraffins of various chain lengths. When hydrogenating hitherto under pressure, one had in view benzines and paraffins with short chains only, as long-chained high molecular products were of no commercial value. In the laboratory there were prepared already paraffins of very large chain length containing for instance 700–900 carbon atoms. Such paraffins are obtained in relatively good output by hydrogenation of carbon monoxide with ruthenium as catalyst (see "Brennstoffchemie", Volume 19, No. 12). These paraffins have melting points of above 130°C and may attain a chain length of more than 700 carbon atoms, if the hydrogenation is properly directed. Technical importance, however, was not obtained by these products.

This invention has as an object the preparation of new and valuable compositions of matter, particularly fiber-forming materials.

A further object is the preparation of filaments, fibers and the like.

Still a further object is the preparation of films, foils and sheets for various purposes.

Still further objects will become apparent as the description proceeds.

It has been found that long-chained paraffins having a chain of at least 400 carbon atoms and being won from coal or carbon monoxide by hydrogenation under pressure, may be worked up into valuable fibers, filaments, ribbons, films, foils and the like. The fibers, filaments, foils, films thus obtained show good tenacity. They are completely water-repellent and of good resistance towards most chemicals. A special advantage of these fibers lies in the very light specific weight, which is lower than that of the usual textile fibers from cellulose and still lower than that of natural silk.

The fibers may be prepared by spinning from the solution. Preferably there are used highly concentrated solutions of the high molecular paraffins in organic solvents, such as toluene or tetrahydronaphthalene. The solvent may be removed either by a precipitating bath or it may be evaporated according to a known dry-spinning-process. The fibers obtained according to this spinning process are advantageously subjected still in a plastic state to an extensive drawing process, in order to increase their tenacity.

The long-chained paraffins melt without decomposition and may be spun therefore directly from the melt. Especially useful for the spinning of fibers directly from the melt is the process according to U. S. Patent application Ser. No. 220,236, filed July 20, 1938. According to this process the material is chemically fed to the spinning nozzle in a solid state and then continuously molten near the nozzle corresponding to the applied speed and pressed through the spinning nozzle in a molten state. It has been found that fibers spun in this way directly from the melt may be oriented at a temperature below their melting point by cold drawing, i.e. the fibers possess a very high plastic elasticity which may be eliminated to any extent by drawing at ordinary temperature ("cold drawing"). In this way the fibers may be drawn into very fine filaments. With the cold drawing there is connected an orientation along the fiber axis which increases the tenacity of the fibers considerably. Similar phenomena have been observed on other synthetic fibers. Since, however, fibers from vinyl polymers, for instance polyvinyl chloride, do not show it, the possibility of an orientation of the fibers in high molecular paraffins is very surprising.

The fibers according to the present invention are very suitable for all textile purposes, in which, however, fastness towards high temperatures is not so much required. The fibers are still fast to boiling. The softening point lies at above 100°C, the melting point at above 130°C. If high molecular paraffins with a carbon chain of 700–900 and more carbon atoms are used, not only the fastness of the fibers towards high temperature is increased considerably, but also their tenacity. With molecular weights above 10,000 the tenacity of the fibers reaches that of cotton and natural silk. At still higher molecular weights the tenacity of cotton and natural silk is even surpassed.

Films and foils may also be cast from solutions or from the melt or may be drawn in a plasticized state. A further possibility for the manufacture of sheets consists in a method by which they are machine-turned from blocks. During the manufacturing process there may be added to the paraffins modifying agents, such as platicizers, pigments, fillers and the like.

As to the foils the so called cold drawing is preferably executed in several directions, whereby in the foils an orientation of the molecules in different directions is produced, thereby improving

the tenacity and elasticity of the foils. It is also possible to effect this orientation of the molecules by rolling. A relatively thick foil is rolled for that purpose at ordinary temperature, until its length in one direction has been increased three to five times. Also such foils show excellent tenacity.

The fibers obtained according to the new process are very suitable for technical purposes on account of their resistance towards chemicals. By a thermoplastic forming process it is therefore possible to produce technically valuable filters consisting of one or several fiber layers. The fibers are also completely insensitive towards rotting and are therefore suitable for electric insulation, fishing nets, ropes, sails and similar structures. The fibers and filaments according to the present invention may also be used for folding hoods of motor cars and similar purposes. Either mechanically or by swelling and afterwards shrinking a permanent crimp may be imparted to the fibers. They are then especially suited as substitute for wool and may be subjected together with wool and other artificial fibers, if desired, to a felting process. For the production of textile fibers the endless ribbons may be converted into staple fibers by tearing or cutting in the usual way.

The application of the films and foils according to this invention is very various. The material prevents extensively diffusion of moisture through the foils. It is therefore most suitable for wrapping foils, especially for food products. The material may also serve as support for photographie films and may be useful as carrier for the light sensitive substance. Most remarkable is the low degree of swelling capacity in water. The electric properties of the foils make it possible to use them for electric insulations, for instance for cables, condensers and the like. It is also within the scope of this invention to use them as tubes, such as skins for sausages which are technically manufactured in large quantities. The foils may also be used as binding sheets for shatter-proof-glass.

JOHANNES KLEINE.