On the new carbon fiber from the petroleum sludge

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A new carbon fiber was prepared from the petroleum sludge which is the waste material left under the process of refining lubricating oil.

The petroleum sludge remains in the form of viscous liquid at room temperature consisting of unsaturated hydrocarbons and sulfuric acid. The petroleum sludge pitch called PS pitch hereafter is obtained under the following treatments:- The petroleum sludge is treated to reduce the content of sulfuric acid to less than 30%. The residue is heated at about 300°C in the nitrogen atmosphere, and then dry-distillated under the reduced pressure. The PS pitch is rather brittle at room temperature but turns into viscous liquid at 200°C over.

When the PS pitch is treated by the ordinary melt-spinning method, it changes into fine and continuous filaments. And as the PS pitch is treated by the centrifuge-method, it also changes into cotten-like filaments. These filaments are pretreated with chlorine, preoxidized in the air at 250°C, carbonized at 800°C in the nitrogen atmosphere, and then graphitized at a higher temperature.

The typical properties of the carbon fiber heat-treated at 800°C are as follows:

Specific gravity	1.60 g/cm^3
Electric resistivity	5-7 x 10^{-3} ohm-cm
Filament diameter	8-12 micron

Tensile strength	5-11 x 10^6 g/cm^2
Loop strength	0.3 - 0.5 g
Elongation percentage	3 - 4 %
Young's modulus	1-4 x 10^8 g/mm^2

The mean molecular weight of the PS pitch has relations with the spinnability and properties of the carbon fiber. X-ray diffraction patterns of the carbon fiber show broad peaks. The p-value of the graphitized fiber heat-treated at 2,600°C, also shows 0.74.