Producing and Applying Ingredients from Secondary Raw Materials of Sunflower Oil Production in Elastomeric Compounds

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Abstract – The directions of using the regenerated waste of sunflower oil production as half-strengthing mineral fillers, plasticizers, and softeners, technological and technological active additives for elastomeric compounds were researched and determined.

Keywords – elastomeric compounds, properties, regenerated by-products of sunflower oil production, the direction of applying, elastomeric compounds ingredients.

Introductions

Modern requirements for balanced natural usage and environmental defense make scientists and producers have a rational attitude toward secondary raw materials of the oil fat industry in Ukraine. Local technology of filtration, in particular of sunflower oil during whitening and filtration (winterization process), means annual waste of dozens of tons of environmentally dangerous oil-filled hydrophobized mineral adsorbent, which due to its composition can be potential raw material during the production of ingredients for elastomeric compounds. From economical, ecological, and import substitution points of view, this is relevant today.

Aim

Therefore the aim of our research was the design ways for producing ingredients based on hydrophobized adsorbent of sunflower oil production and the development of rational directions of mineral and organic component use in elastomeric compounds.

Materials and methods

Regeneration of raw hydrophobized mineral adsorbent was held through its filtering with solvents and annealing at a temperature of 800 °C. The fat-, wax-containing fraction of used filtering powder was received as a result of hydrophobized adsorbent washing with solvents and further liquid fraction thermostating at 100 °C and 160 °C. Fatty acids amides synthesis was carried out according to known methods.

Determining of physical and chemical properties of the initial hydrophobized adsorbent, its regenerated types, fat-, wax-containing organic component, and amide derivatives was made according to different instrumental methods.

Assessment of type and concentration of researched substances as fillers, softeners, technological active additives, and stabilizers impact on the formation of elastomeric compounds properties complex in laboratory conditions was carried out in rubber compositions and model and industrial type vulcanizates based on carbo chained general and special purpose rubbers.

Results and discussion

The impact of 10, 20, and 30 phr. hydrophobized mineral adsorbent and its purified (regenerated) form relative to kaolin on elastomeric compound properties based on stereoregular butadiene-α-methyl styrene rubber SBR-1500 was researched. It is shown [1], that the regenerated form of the product is a half-strengthing mineral filler, which provides rubber compositions with improved technological properties and a satisfactory balance of kinetic parameters of vulcanization.

It is recommended for usage in rubber compositions for the compressive method of rubber product production.

The technological, vulcanization and physical-mechanical properties features of elastomeric compounds based on cis-1,4-polyisoprene rubber SKI-3 during the introduction of researched products of filtered and annealed used adsorbent of sunflower oil filtering in the proportion of 20-80 phr. were determined [2]. The advantage in temperature resistance and resistance to thermal aging at optimal dosage in 20 phr. of researched products was established. The possibility of applying regenerated mineral products as filler in tire elastomeric compound composition based on general-purpose rubbers.

The technological, vulcanization, dynamic, relaxation, and physical mechanical elastomeric compounds properties formation for running part of the tread production at a by-product after sunflower oil winterization organic component presence as plasticizer-softener was researched. Compared to industrial petrochemical lubricants Nytex 4700 researched product increases the cohesive strength of rubber composition by 1.5 times, saving vulcanization parameters and providing higher resistance to reversion and relaxation processes at 100 °C by 30-40 %, lower level of dynamic losses, high level of physical-mechanical characteristics [3].

According to the results of model non-filled and filled elastomeric compositions based on butadiene-α-methyl styrene rubber SBR-1500 it is established, that fat-, wax-containing component from sunflower oil production secondary raw material has an impact on sulfuric vulcanization process as a technological additive and provides 1.3 times higher fatigue endurance of rubber with repeated stretching comparatively to stearic acids. Fatty acids amides derivatives, deepening the vulcanization process, can be classified as technological active additives [4].

Conclusions

The possibility of powder-like and liquid products from sunflower oil production secondary raw material synthesis is shown. Those products can demonstrate half-strengthing impact as mineral half-strengthing fillers (solid phase and as technological and technological active additives of polyfunctional effect (fat-, wax-containing fraction and its amides derivatives) in elastomeric compositions based on diene rubbers.

Synthesized products are examples of resource conservation in oil production enterprises and import substitution of ingredients in rubber composition recipes for tire and rubber products production.

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