Уникальные химические и физические свойства углеродных нановолокон и нанотрубок позволяют рассматривать их как эффективный усиливающий и функциональный наполнитель композитов, катализатор и носитель катализаторов, сорбент и аккумулятор водорода, материал для зондов туннельной, сканирующей, атомно-силовой и магнитно-силовой микроскопии, чувствительный элемент наносенсеров газоанализаторов. [2]

И все это мы можем получить из сажи (технического углерода).

Углеродные нановолокна и нанотрубки - неотъемлемая, составная часть понятия «Нанотехнология». Работы в этом направлении считаются приоритетными во всем мире, а в некоторых странах реализуются в рамках национального проекта.

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CHEMICAL PRODUCTS OBTAINED DURING THE SEPARATION OF LIQUID PRODUCTS OF FAST PYROLYSIS OF WOOD, AS A CONTRIBUTION TO GREEN ENERGY

Abstract. *The article discusses the various uses of water-soluble and water-insoluble components of liquid wood pyrolysis products. Various commercial products are described with the identification of vulnerable aspects of use. The most promising ways of using as chemical products are highlighted.*

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ХИМИЧЕСКИЕ ПРОДУКТЫ, ПОЛУЧЕННЫЕ ПРИ

РАЗДЕЛЕНИИ ЖИДКИХ ПРОДУКТОВ БЫСТРОГО ПИРОЛИЗА ДРЕВЕСИНЫ, КАК ВКЛАД В ЗЕЛЕНУЮ ЭНЕРГЕТИКУ

Аннотация. *В статье рассматриваются различные виды применения водорастворимых и нерастворимых в воде компонентов жидких продуктов пиролиза древесины. Различные коммерческие продукты описываются с указанием уязвимых аспектов использования. Выделены наиболее перспективные способы использования в качестве химических продуктов.*

For many centuries, liquid pyrolysis products of wood have been the main raw materials for the production of chemicals such as methanol, acetic acid, turpentine, resin, etc. Currently, most of these products can be obtained at a lower cost from natural gas, oil or coal. Although more than 350 components have been found in liquid products of fast pyrolysis of wood, their content is small and the isolation of individual chemicals, as a rule, is practically and economically impractical, since it requires the use of complex separation technologies. Therefore, the greatest interest is the development of technologies for separating products from the bulk liquid products of fast pyrolysis of wood or from their basic, easily separated fractions.

Liquid products of fast pyrolysis of wood can be easily divided into two fractions by adding water. At the same time, the liquid loses phase stability, and a viscous oligomeric fraction (settling resin) with a specific gravity of 1.05-1.10, mainly consisting of lignin decomposition products, settles to the bottom, and the water-soluble fraction remains in the upper layer [1].

The aqueous extract of liquid products of fast pyrolysis of wood contains low molecular weight aldehydes, alcohols, carboxylic acids and oxy acids, lactones and phenolic compounds. Although there are developments on the use of various types of solvents, especially to increase the purity of lignin decomposition products, the most promising technology is water extraction.

In particular, Red Arrow Products Company, USA has patented and marketed a number of food flavoring additives "liquid smoke", which are obtained from water-soluble fractions of liquid pyrolysis products [2]. A potential direction of using the water-soluble fraction of liquid products of fast pyrolysis of wood is also the production of calcium salts of carboxylic acids, which can be used as eco-friendly de-icing agents for roads. Volatile organic acids (formic, acetic, propionic), which are present in the aqueous extract, can be separated by distillation. Although this distillate also contains other volatile compounds (aldehydes and esters), they can either react with lime or evaporate during the reduction of solid calcium salts. Large-scale

production of de-icers from biomass is technically possible, but currently economically impractical. Calcium chloride is a cheaper de-icer, because it has a harmful effect on plants. The average fraction of oils (240-310 ℃) is used as an inhibitor for fuels and oils. Flotation reagents, softeners for the rubber industry and other valuable products are also obtained from oils. Foundry fasteners are obtained from pitch. The water-soluble fraction of liquid products contains phenols, carbohydrates, lactones and is used to produce viscosity reducers of clay solutions and casting fasteners. Extraction resin containing 30% or more phenols was also used to obtain viscosity reducers [3].

The water-insoluble fraction of liquid products of fast pyrolysis of wood, which usually makes up 25-30% of the total liquid products, is often called pyrolytic lignin, since it mainly consists of oligomeric fragments formed during the decomposition of lignin. Currently, technologies for the production of products with high added value from this fraction are under development. However, the technology of using pyrolytic lignin as a phenol substitute in the production of phenol-formaldehyde resins is close to commercialization. The largest contribution to the research on the production of adhesive resins based on pyrolytic lignin was made by the companies NREL and Biocarbons, USA, Ensyn and Pyrovac, Canada and ARI, Greece. Sumarokov V.P. and Uvarov I.P. also worked in this direction [4]. Although the aromatic components of pyrolysis products are less reactive than phenol, 30-50% of phenol can be substituted with pyrolytic lignin to produce high-quality resins based on biophenols [6]. These resins have been successfully used as a binder for the production of plywood and wood boards with high mechanical strength. Lower toxicity and lower cost make pyrolytic lignin an attractive component for the production of binders. Such manufacturers of binders and plates as Louisiana Pacific, Weyerhausen, A.C.M. Wood Chemicals, etc. they are actively engaged in the commercialization of binders based on liquid products of fast pyrolysis of wood [5].

Liquid products of wood pyrolysis are used in the production of adhesive resins as binding agents, in foundry production, as a binder for activated carbons and can be used as a binder for road construction. In addition, there is experience in the energy use of liquid products of fast pyrolysis of wood, as chemical raw materials, obtaining fuels, hydrogenation, hydrodeoxygenation and hydrocracking of components with the use of motor fuels, catalytic cracking, etc.

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ПОЛУЧЕНИЕ МЕМБРАН ДЛЯ ВОДОРОДНОЙ ЭНЕРГЕТИКИ НА ОСНОВЕ СПЛАВОВ ПАЛЛАДИЯ С СЕРЕБРОМ

Аннотация. *Разработан способ магнетронного напыления пленок металлических сплавов с образованием сплава из чистых компонентов мишени в процессе напыления. Разработаны способ модификации поверхности палладий содержащих мембран путем формирования на их поверхности высокодисперсного слоя палладиевого переносчика водорода.*

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PRODUCTION OF MEMBRANES FOR HYDROGEN ENERGY BASED ON PALLADIUM AND SILVER ALLOYS

Abstract. *A method has been developed for magnetron sputtering of metal alloy films with the formation of an alloy from pure target components during sputtering. A method has been developed for modifying the surface of palladium-containing membranes by forming a highly dispersed layer of a palladium hydrogen carrier on their surface.*

В настоящее время ископаемые виды топлива (нефть, уголь и природный газ) являются основными источниками энергии в мире.