Research Group

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in geology, mineral resources, mining and metal industry

Colophony Market in CIS

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Introduction

Colophony is a solid basic part of tarry matter of coniferous wood, which is left after distillation of volatile substances, i. e. turpentine. It is a fragile vitreous transparent resin of light-yellow to dark-brown color. Colophony contains 60-92% of resin acids (mainly abietic acid), 0.5-12% of both saturated and unsaturated fatty acids, 8-20% of neutral substances (sesqui-, di- and tri-turpentines). Colophony is easily soluble in diethyl ether, absolute ethanol, acetone, benzol, to some degree soluble in benzine, kerosene, and is not soluble in water. Is distilled with vapor overheated to 200°C without any decomposition. Softening point of colophony is 40-75°C, melting point is 100-140°C, and crystallization temperature is 95-110 ° C.

Interacting with mineral and organic alkali, colophony forms salts (the so-called colophony soap), e.g. $C_{19}H_{29}COONa$, and interacting with alcohols (mainly with polyatomic ones) it forms colophony ethers. Heating colophony with metal oxides (such as zinc, calcium, aluminium, barium etc.) leads to forming resinates used as siccatives. Colophony, especially in ground state, is easily oxidized with oxygen and reacts with other substances as is appropriate for resin acids.

1. Production of Colophony in Russia and CIS

1.1. Raw Materials and Technology for Production of Colophony

There are distinguished three kinds of colophony, depending on the raw material and the method used, namely gum rosin, wood rosin, and tall rosin.

Tall rosin is the principal kind of colophony produced in Russia. Its manufacturing is closely connected with production of ***cellulose***.

The technological chain of manufacturing cellulose using wood raw materials includes sawing the material, removing the bark, chopping into chips and sorting the chips, boiling the chips in alkaline solution, purifying, drying and cutting the output product.

The principal method of boiling cellulose is the ***sulfate*** one. This method allows processing wood of different species through boiling the chips in cooking liquor (alkaline solution containing 9-10% NaOH and sodium sulfite) during 5-7 hours at a temperature of 165-170°C and a pressure of 0.6-0.8 MPa. Wasted ***sulfate alkaline solution*** (a black liquid with strong smell) is a mixture of washing cellulose filtrate and cooking liquor. After boiling, the wasted alkaline solution is removed, subjected to oxidation, evaporation and burning. The oxidation is carried out for decreasing losses of sulfur during evaporation, as well as for better regeneration of the sulfur. Evaporation is carried out in vacuum, to obtain the content of dry substances of 55-65%. The purpose of burning is regeneration NaOH and Na_2S, which are used again for preparation of the cooking liquor, and for utilization of the heat produced at burning the alkaline solution.

Before evaporating the sulfate alkaline solution, ***sulfate soap*** is separated through settling the solution. Sulfate soap produced at processing foliferous wood does not contain any resin acids. Sulfate soap produced of coniferous wood is an unctuous dark-brown liquid with a smell of methyl-sulfurous combinations. Output of the sulfate soap per 1 ton of cellulose is 100-120 kg for pinewood and 40-60 kg for fir wood.

Sulfate soap, in its turn, is a raw material for production of ***tall oil***. Tall oil is a mixture of organic chemical combinations obtained through decomposition of sulfate soap under the action of sulfuric acid. It is a dark-colored liquid with a strong smell. Contents of resin acids (abietic, neo-abietic, palustric, pimaric etc.) in tall oil obtained from coniferous wood is 40-50%, and from the mixture of coniferous and foliferous wood, 18-22%.

Tall rosin is obtained by processing tall oil through vacuum rectification.

Table 1 shows data on production of sulfate cellulose (boiled) at Russian enterprises manufacturing tall rosin in 1997-2005. Generally, production increased approximately 2.3 fold over the said period, which indicates a good potential for production of tall rosin.