

1: OSA | Infrared Spectra of Xanthates and Related Compounds

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Such a mixture can be used to cure a vulcanizable rubber composition containing less than 0. Nitrosamines of the formula $R_a R_b NNO$ are known to be present in, and formed from, corresponding dithiocarbamates and thiuram sulphides. Nitrosamines can also be formed from other N-containing compounds used in rubber processing, e. EPDM ethylene-propylene-diene-modified rubber is conventionally cured using a combination of dipentamethylenethiuram hexasulphide, tetramethylthiuram disulphide and tellurium diethyldithiocarbamate. Neoprene is conventionally cured using zinc oxide activated with a thiourea e. The nitrosamines are recognised to be carcinogenic in animals. Among those nitrosamines tested, only those with exceptional structures, e. Nitrosamines in which R_a and R_b are each methyl, ethyl, propyl or butyl groups, or R_a and R_b together represent the pentamethylene group, are particularly potent. Nitrosamines are of potential danger wherever they can come into contact with foodstuffs or sensitive skin, or wherever they can build up in a closed atmosphere, e. There is a risk of exposure to nitrosamines during the manufacture of dithiocarbamates and related compounds, and during their use in manufacturing rubber goods. The presence of nitrosamines in rubber goods is potentially of risk to humans. Rubber of the type used for baby teats and soothers typically has a nitrosamine content of about 0. Very careful formulation and washing is needed to reduce this concentration to an acceptable level for babies, i. Other undesirable N-containing materials are used in rubber processing, including thioureas. Such toxic compounds, and also isocyanates and isothiocyanates, are formed by thermal breakdown in common N-containing curing systems, and are present in the fumes from rubber processing operations. It is stated in U. It is also stated, although there is no evidence, that no free sulphur need be added. This is the only instance given in which no amine is used, and the state of cure is very poor by comparison with the products of the other Examples, in which dibenzylamine, ethylaniline or aniline is present. The amount of sulphur is such that it will almost certainly bloom. In one reported case in U. It should be noted that neither zinc oxide nor sulphur is present. In neither of the given specific instances from the prior art is the product likely to be of practical utility. A tensile strength of at least 10, and very often at least 20, kPa is desirable. Perhaps for this reason, among others, xanthogen polysulphides as described in the given prior art appear not to have been used on any commercial scale, over the last 50 years. Xanthogen disulphides are used as chain-length modifiers in, for example, emulsion polymerisation processes, and have been proposed as accelerators, almost always in combination with an activator such as dibenzylamine. Known accelerators for use in rubber compositions include xanthates, usually in conjunction with an amine activator. A second object is to provide rubber compositions which cure satisfactorily in the presence of as little as possible and preferably in the absence of dangerous N-containing materials such as nitrosatables, including tertiary and, especially, secondary amines. It is generally the case that primary amines and unreactive N atoms, such as are in aromatic heterocyclic ring systems, e. Novel vulcanisable compositions according to the present invention comprise parts by weight rubber; a dihydrocarbyl xanthogen polysulphide; a xanthate as defined above; and less than 0. A novel process for preparing a vulcanised rubber article comprises vulcanising a vulcanisable composition comprising parts by weight rubber, a dihydrocarbyl xanthogen polysulphide and less than 0. The article may be used by insertion into the mouth, for example, a mouthpiece for use in anaesthesia or oxygen supply in atmospheres of low or nil oxygen content, e. The article may be a baby product such as a teat, soother or dummy. Further examples of articles of the invention which may contact skin are goggles, skin-diving suits, gloves including surgical gloves, surgical rubbers, contraceptives, balloons and furnishings. The article may be an automobile component, e. An article potentially of particular value is an aircraft tire, owing to the fact that the invention provide vulcanised natural rubber articles free or substantially free of nitrosatables during both manufacture and use, and also because reversion can be low or non-existent. In general, a vehicle may comprise an article of the invention, whether as a tire or as an item of furnishing. The

content of nitrosatables in a composition or product of the invention is preferably as low as possible. Especially when natural rubber is used, the level of harmful material is preferably no more than 0. By careful choice of constituents and reactants, an article of the invention can have such characteristics. The use of N-containing materials such as secondary and tertiary amines is not inevitably excluded from the present invention; in certain circumstances, the use of such compounds appears to be necessary in order to provide a satisfactory degree of cure, especially when the rubber is a synthetic rubber. Nevertheless, the level of such materials, according to the present invention, is considerably lower than has previously been used, and this represents a major technical advance. There is less than 0. These figures are expressed in parts by weight per parts by weight of rubber. The present invention is based on the utility of dihydrocarbyl by "hydrocarbyl", we include substituted hydrocarbyl xanthogen polysulphides as rubber curing agents; this utility has been made more acceptably effective than hitherto. The polysulphides may have the formula $R_1-O-C(S)_x-C(S)-OR_2$ wherein R_1 and R_2 are the same or different and are each alkyl, cycloalkyl or N-free heterocyclic groups optionally substituted by substituents which either do not contain nitrogen or do not give rise to nitrosatable amines, and x is at least 2, and often greater than 2. The maximum number of carbon atoms in R_1 or R_2 , and preferably both, is usually about 10. R_1 and R_2 are preferably each C alkyl and are usually the same, e. A xanthogen polysulphide of the given formula can be prepared by reacting the corresponding xanthogen disulphide with sulphur or by reacting a xanthate salt, e. It is known in the art that the products of these reactions are mixtures of compounds in which x is 3, 4, 5 or higher; when the product is analysed the value of x is not necessarily integral, but the components of the mixture can be separated at least partially by chromatographic techniques. The amount of the curing agent as defined above, for vulcanisation, is usually at least 1, preferably at least 1. The curing agent can be formulated with rubber and any other conventional components which may be needed, to form a vulcanisable composition which is then vulcanised. The vulcanisable composition may include sulphur, e. The temperature of vulcanisation of a dry rubber composition is preferably at least 100 C, e. The vulcanisation temperature is usually 150 to 200 C for a latex. The composition may be formed, before, during or after curing, into a desired article, e. It is often desirable, on economic grounds, that the speed of vulcanisation of a cure system used in the invention should be increased by the use of activators. Activators which work satisfactorily with the curing agents of the invention are primary amines and also their sulphonated derivatives sulphenamides, but it should be noted that sulphenamides are nitrosatable. The use of xanthogen polysulphide curing agents can obviate the need for amine or other accelerator materials. In any case, conventional secondary amine accelerators such as dibenzylamine should not be used owing to their nitrosamine-generating properties. Nevertheless, it has surprisingly been found that xanthates are especially good activators for xanthogen polysulphides. Examples are dihydrocarbyl xanthates and metal hydrocarbylxanthates, e. The metal hydrocarbylxanthates are often preferred. The amount of xanthate with respect to rubber may be 0. The rubber which is used will be chosen as necessary. It may be in latex or dry form. Natural rubber or synthetic polyisoprene is preferred. A composition of the invention may include conventional rubber processing additives and components such as fillers, processing aids and anti-oxidants. Carbon black, for example, may be used in an amount of 25 to 100 pphr. A conventional inorganic activator which may be used is zinc oxide. A conventional organic activator and processing acid which may be used is stearic acid. Another known processing aid which may be used comprises a paraffinic processing oil. An anti-oxidant should not be nitrosatable; a phenol such as Antioxidant 101, i. The following Examples illustrate the preparation of rubbers suitable for use in the invention. All parts are by weight. The procedures of Examples 1 to 9 use a diisopropyl xanthogen polysulphide, principally the tetrasulphide, which is referred to as DIXT, for simplicity. The mixture was treated on a mill at 60 C, with the addition of 3. After curing at 150 C, the product, in sheet form, had satisfactory properties. The rubber was masticated for 2 minutes before adding the other four ingredients of the first composition. After mixing, the formulation was sheeted out on a 16 inch laboratory mill, mill additions being made on 12 inch laboratory mill rolls at 60 C. The respective formulations were then cured at 150 C for 30 min. The additives are tabulated below amounts in parts, using abbreviations as given above and as follows: In the products with the highest degree of cure, the initial induction period was almost unacceptably fast. The differences between the

given results for the Examples of the invention and the comparative Examples are sufficiently small that the primary object of the invention, improvement in the environment, by reducing or eliminating the use of undesirable N-containing and tellurium compounds, is achieved. The additives amounts in parts are tabulated below, using abbreviations as given above and as follows: The differences between the given results for the five Examples of the invention and the two comparative Examples are sufficiently small that the primary object of the invention, improvement in the environment, by reducing or eliminating the use of undesirable N-containing compounds, is achieved. The respective formulations were cured at C for 30 min. This latex was then used in five formulations, in which the ingredients were incorporated as solutions, emulsions or dispersions as appropriate. The ingredients amounts in parts are tabulated below, using abbreviations as given above and as follows: The pre-cure formulations were strained, flowed into films and dried at room temperature. The films were tested for tensile strength at break T_b and elongation at break E_b . The results were as follows: In the following Table, T_{b0} and T_{b20} respectively indicate the tensile strength without curing and after curing at 20 min. After this period, both formulations reached a cure state as represented by a "Chloroform Number" of 3. Both were strained and then flowed into films, dried at room temperature and tested, with the results: All four formulations were satisfactorily cured within a maximum of 10 min. Claims 12 I claim: A vulcanizable composition which comprises parts by weight rubber; from about 1 to about 6 parts by weight dihydrocarbyl xanthogen polysulfide of the formula $R_1-O-C(S)-S_x-S-C-O-R_2$ wherein R_1 and R_2 are the same or different and selected from the group consisting of alkyl, cycloalkyl and N-free heterocyclic groups and x is an integer of at least 2; from about 0. A composition according to claim 1, in which the rubber is in latex form. A composition according to claim 1, which comprises from 1.

2: Xanthates and related compounds as versatile agents in colloid science - EM|consulte

Xanthate salts characteristically decompose in acid: $ROCS_2K + HCl \rightarrow ROH + CS_2 + KCl$. This reaction is the reverse of the method for the preparation of the xanthate salts.

Description This invention relates to the preparation of alkyl xanthates from phenols. Primarily the alkyl xanthates are valuable as commodity chemicals. One of the desirable characteristics of the alkyl xanthates prepared from phenols is that the xanthates can be rearranged, then hydrolyzed to give thiophenols. The thiophenols can then be used in pharmaceuticals, herbicides, dyes, and as chemical intermediates. Current methods for producing alkyl xanthates of phenols generally provide a poor yield of the xanthate product. One such method reacts carbon disulphide and potassium phenolate in dimethylformamide to form a potassium xanthate. Because of a high demand for alkyl xanthates of phenols, alternative production methods are desirable. A method for producing the xanthates in a good yield as well as in an acceptable purity would be especially advantageous. It is a further object of this invention to provide a method for producing alkyl xanthates of phenols yielding a high percentage of product. It is still a further object of this invention to provide a readily controllable method for producing alkyl xanthates of phenols. It is yet another object of this invention to produce alkyl xanthates of phenols that have an acceptable purity level. Other objects and aspects, as well as the advantages of this invention are apparent from a study of this disclosure and appended claims. According to this invention, alkyl xanthates of phenols are prepared by a method comprising: The procedure and selection of reagents utilized in this synthesis is a significant part of the invention. It has been discovered that if the alkali metal salt of the phenol contains substantially no water when the sulfur source is contacted with the salt of the phenol, the yield of the xanthate is increased. Further, it has also been discovered that the product yield is enhanced if a compatible solvent is employed during the synthesis. In the preferred embodiment of this invention, alkyl xanthates of phenols are prepared by the following synthesis: Generally the alkali metal salt of a phenol is formed by neutralizing a phenol with a base component. Once formed, the alkali metal salt of a phenol must be substantially free of water before the carbon disulfide is included in the reaction mixture. The absence of water in the reaction mixture before the carbon disulfide is employed can be accomplished by several techniques. These techniques include employing an alkali metal hydride as the base component or employing a water removal system after the phenol is reacted with the base. When an alkali metal hydride is employed as a base component in this invention for the purpose of neutralizing the phenol, the resulting alkali metal salt of the phenol can be directly contacted with carbon disulfide. An intervening water removal step is not needed because the alkali metal salt of the phenol contains substantially no water upon formation. Examples of such alkali metal hydrides that can be employed as the base component can be represented by the structure MH where M is an alkali metal as defined above. More preferably, the alkali metal hydride is sodium hydride, potassium hydride, or mixtures thereof, and most preferably, sodium hydride. At this time, alkali metal hydrides are somewhat expensive. Therefore, for purposes of economic efficiency, the alkali metal hydride bases are not a preferred technique employed for preparing a reaction mixture of an alkali metal salt of a phenol that contains substantially no water. Although employing an alkali metal hydride eliminates the need for a water removal system, the high cost of alkali metal hydrides currently discourages large scale operation of this technique. Alternatively, a water removal system is necessary when a base with an hydroxide --OH or carbonate --CO₃ anion is reacted with a phenol to form the alkali metal salt of the phenol. This water removal system is necessary because water is formed during the reaction between the phenol and the base. Bases with an --OH or --CO₃ anion are generally employed in this invention because of their availability and low cost. More preferably the base component is selected from the group consisting of sodium hydroxide, potassium hydroxide, lithium hydroxide, sodium carbonate, potassium carbonate, or mixtures thereof, although other alkali metals may be employed. At the present time, for purposes of availability and economy, the base component most preferably sodium hydroxide is employed. The water removal system that can be used to remove water from the alkali metal salt of a phenol formed by reacting a --OH or --CO₃ anion base with a phenol is preferably a distillation system. Examples of distillation systems

that are preferred include azeotropic distillation and nitrogen sparge distillation. More preferably an azeotropic distillation is employed. In an azeotropic distillation system, water and another compound form an azeotrope and are distilled out together by employing either simple or fractional distillation. Compounds that form an azeotrope with water, and are therefore appropriate for use in this invention, include toluene, benzene, xylene, and other such aromatic compounds and mixtures thereof. Once the compound selected forms an azeotrope with the water. Both the compound and water are distilled off the reaction mixture at a low enough temperature so that no change occurs in the alkali metal salt of a phenol. According to this invention, any phenol can be combined with the base component. Examples of phenols include those with one hydroxy --OH group on an aromatic ring system such as benzene, naphthalene, anthracene, phenanthrene, or those phenols with more than one hydroxy group on the aromatic ring such as resorcinol or hydroquinone. More preferably, the phenol is selected from the group consisting of phenol, o-cresol, m-cresol, p-cresol, o-chlorophenol, m-chlorophenol, p-chlorophenol, o-ethylphenol, p-ethylphenol, m-ethylphenol, 2,6-dimethylphenol, 3,5-dimethylphenol, and mixtures thereof. Currently a cresol is most preferred as the phenol neutralized by the base component. The selection of a solvent compatible with the reagents employed in the alkyl xanthate synthesis is important in obtaining a good yield of the alkyl xanthate. The solvent may be included in the reaction mixture at any point, but preferably the solvent is employed at the onset of the inventive method and is included in the phenol and base reaction mixture. The primary function of the solvent is to keep the reagents in a homogenous solution and to ensure a complete reaction between reagents. Additionally, depending upon the selection of solvent, if distillation is employed to remove water, the solvent may keep the temperature of the reaction pot lower during distillation. Preferred solvents include 2-methoxyethyl ether, sulfolane, 2-ethoxyethyl ether, dimethyl sulfoxide, diethylene glycol dibutyl ether, ethylene glycol diethyl ether, triethylene glycol dimethyl ether, and the like, and mixtures thereof. More preferably, the solvent is selected from the group consisting of sulfolane, dimethyl sulfoxide, 2-methoxyethyl ether, or mixtures thereof. Most preferably the solvent is a mixture of 2-methoxyethyl ether and sulfolane. Carbon disulfide is contacted with the alkali metal salt of a phenol after the alkali metal salt of a phenol is substantially free of water. According to the invention, an alkylating agent is then contacted with the reaction mixture containing the alkali metal salt of a phenol and the carbon disulfide after said salt and carbon disulfide have substantially reacted. More preferably the alkylating agent is selected from the group consisting of methyl iodide, methyl chloride, methyl fluoride, methyl bromide, ethyl bromide, ethyl chloride, ethyl iodide, ethyl fluoride, dimethyl sulfate, diethyl sulfate, and mixtures thereof. For purposes of availability and cost at this time, methyl chloride is most preferably employed as the alkylating agent. The amount of each reagent employed in the process is not critical. Generally, reagents are employed in equal amounts. Some excess base or carbon disulfide can be used. A large excess of alkyl halide can also be used. The alkyl xanthate is formed upon contacting the alkylating agent with the reaction mixture. After completion of the final reaction, the alkyl xanthate is recovered. The work-up and recovery of the alkyl xanthate can be accomplished by appropriate methods known to those skilled in the art. For example, a solvent such as ethyl ether, methylene chloride, chloroform, tetrahydrofuran, cyclohexane, or mixtures thereof, is combined with the alkyl xanthate reaction mixture to form a solution. The solution is then washed with water, followed by a drying step with, for example, anhydrous magnesium sulfate, whereupon the xanthate is separated by the solvent by an evaporation technique. The main impurities found in the final product are generally the solvent and distillation azeotropic compound, if employed, and unreacted reagents or intermediate products. Purity of the final alkyl xanthate product can be improved by recovering the final product by distillation under reduced pressure. The examples following should be taken as exemplary and not exclusive in illustrating the invention. The flask was then flushed with N₂ for the first 5 minutes then turned down to a slow flow approximately 1 bubble every 2 seconds. The flask was thereafter placed in a room temperature water bath with The mixture was stirred to dissolve the NaOH pellets with slight heating for 15 minutes. After the NaOH was dissolved, ml of toluene were added. Heat was then applied to reflux to azeotrope water out of the flask. Approximately 10 ml of water was removed, then ml of toluene was refluxed off. The reaction flask was subsequently cooled to room temperature and the flask was returned to the room temperature water bath where The flask was stirred for an

additional 2. The mixture was then stirred overnight and worked-up by using ml H₂O and ml ethyl ether to transfer mixture to a 2 L funnel, where the 2 L funnel was agitated and the ether layer separated and saved. The water layer was separated and extracted with ml of ethyl ether. This extract was then combined with the first ether extract and washed three times with 50 ml H₂O each time, dried with anhydrous magnesium sulfate, rotovaped, weighed, and analyzed using a gas chromatograph. The recovered product, methyl xanthate of p-cresol, weighed The calculated yield of product was In this Example, as in Examples II-VII, the main impurities in the final product were the solvent, toluene, and unreacted p-cresol or methylated p-cresol. A purer xanthate product could be obtained by distillation under reduced pressure. To get the solid back into solution, ml of sulfolane was added. The resulting solution was then stirred overnight. The mixture was then worked-up using the procedure of Example I. The product, methyl xanthate of p-cresol, weighed The amount of solvent employed was ml sulfolane and ml of 2-methoxyethyl ether. The resulting methyl xanthate of p-cresol weighed The weight of the product, methyl xanthate of o-cresol, was Just prior to the distillation, ml of dimethyl sulfoxide was employed for purposes of acting as a solvent. After the azeotropic distillation step, the entire solution turned solid after returning to room temperature. To convert the mixture back to a solution, ml of sulfolane was added. Once the reaction mixture was back into solution, and the carbon disulfide was added and stirred, The weight of the product, ethyl xanthate of p-cresol, was The product, methyl xanthate of a p-cresol, weighed The product, ethyl xanthate of a p-cresol, had a weight Claims 15 That which is claimed is: A method of preparing alkyl xanthates comprising: A method according to claim 3 wherein said base is sodium hydroxide; said phenol is a cresol, said solvent is a mixture of sulfolane and 2-methoxyethyl ether; and said azeotropic distillation compound is toluene.

3: WikiZero - Xanthate

The present account discusses yet another and little explored family of useful compounds, alkyl xanthates - and related materials such as thiocarbamates and trithiocarbonates - (Fig. 1), as convenient and highly versatile reagents in colloid science of metal, metal chalcogenide and metal oxide colloid science and technology.

It is a pale yellow powder, which is usually obtained as the dihydrate. Sodium ethyl xanthate is used in the mining industry as a flotation agent. Production As with most xanthates, sodium ethyl xanthate can be prepared by treating sodium ethoxide with carbon disulfide: It is relatively stable in water at high pH if not heated. It rapidly hydrolyses at pH conjugate base. Sodium ethyl xanthate easily adsorbs on the surface of solid sulfides. There are at least six chemical detection methods: Iodometric method relies on oxidation to dixanthogen by iodine, with the product detected with a starch indicator. This method is however is not selective and suffers from interferences with other sulfur-containing chemicals. This method has an advantage of being is insensitive to sulfite, thiosulfate and carbonate impurities. The excess acid and impurities are removed through filtering and titration. The drawbacks of this method are high cost of silver and blackening of silver xanthate by silver nitrate that reduces the detection accuracy. The product is detected with thiofluorescein. The product is titrated with perchloric acid and detected with crystal violet. There are also several electrochemical detection methods, which can be combined with some of the above chemical techniques. This application was introduced by Cornelius H. Other applications include defoliant, herbicide and an additive to rubber to protect it against oxygen and ozone. The polar part of xanthate molecule attaches to the ore particles with the non-polar hydrocarbon part sticking out and forming a hydrophobic layer. Then the particles are brought to the water surface by air bubbles. The efficiency of the hydrophobic action increases, but the selectivity to ore type decreases with increasing length of the hydrocarbon chain in xanthates. The chain is shortest in sodium ethyl xanthate that makes it highly selective to copper, nickel, lead, gold and zinc ores. The most affected organs were the central nervous system, liver and spleen. This decision was justified by the widespread use of the chemical in industry and its decomposition to the toxic and flammable carbon disulfide gas. From two examples of sodium ethyl xanthate spillage in Australia, one resulted in evacuation of people and hospitalization of 6 workers who were exposed to the fumes. In another accident, residents of the spillage area complained of headache, dizziness and nausea. Retrieved 22 February Journal of the Chemical Society Resumed: Report 5 pp. Patent 1,, "Concentration of gold, sulphide minerals and uranium oxide minerals by flotation from ores and metallurgical plant products" Report 5 p. Secondary Notification Assessment Report No.

4: Xanthates And Related Compounds by S. Ramachandra Rao

Xanthates And Related Compounds has 1 rating and 0 reviews.

As with most xanthates, sodium ethyl xanthate can be prepared by treating sodium ethoxide with carbon disulfide: It is relatively stable in water at high pH if not heated. It is the conjugate base of the unknown strong acid with pKa of 1. Sodium ethyl xanthate easily adsorbs on the surface of solid sulfides. There are at least six chemical detection methods: Iodometric method relies on oxidation to dixanthogen by iodine, with the product detected with a starch indicator. This method is however is not selective and suffers from interferences with other sulfur-containing chemicals. This method has an advantage of being is insensitive to sulfite, thiosulfate and carbonate impurities. The excess acid and impurities are removed through filtering and titration. The drawbacks of this method are high cost of silver and blackening of silver xanthate by silver nitrate that reduces the detection accuracy. The product is detected with thiofluorescein. The product is titrated with perchloric acid and detected with crystal violet. There are also several electrochemical detection methods, which can be combined with some of the above chemical techniques. This application was introduced by Cornelius H. Other applications include defoliant, herbicide and an additive to rubber to protect it against oxygen and ozone. The polar part of xanthate molecule attaches to the ore particles with the non-polar hydrocarbon part sticking out and forming a hydrophobic layer. Then the particles are brought to the water surface by air bubbles. The efficiency of the hydrophobic action increases, but the selectivity to ore type decreases with increasing length of the hydrocarbon chain in xanthates. The chain is shortest in sodium ethyl xanthate that makes it highly selective to copper, nickel, lead, gold and zinc ores. The most affected organs were the central nervous system, liver and spleen. This decision was justified by the widespread use of the chemical in industry and its decomposition to the toxic and flammable carbon disulfide gas. From two examples of sodium ethyl xanthate spillage in Australia, one resulted in evacuation of people and hospitalization of 6 workers who were exposed to the fumes. In another accident, residents of the spillage area complained of headache, dizziness and nausea. Retrieved 22 February Journal of the Chemical Society Resumed:

5: Xanthate | chemical compound | www.enganchecubano.com

Ab initio molecular orbital techniques have been used to calculate a number of properties of the xanthate anion, (OH)CS-1 2, and related molecules, to assist in the characterization of xanthate collector species formed on sulfide mineral surfaces during froth flotation.

6: Xanthate - Wikipedia

Xanthates, thiocarbamates and trithiocarbonates are highly useful compounds in surface and colloid science and in the context of nanotechnology of particles, self-assembly and surfaces. Similar to thiols they have a strong affinity to metal and metal ion-containing surfaces and particles.

7: Xanthate-KNOWPIA

Xanthate, any of a class of organic salts formed by treatment of an alcohol with carbon disulfide in the presence of an alkali. The term is derived from the Greek word xanthos, for "yellow," in reference to the compound potassium ethyl xanthate (C₂H₅OCS₂K), which gives a yellow precipitate when combined with copper sulfate.

8: USA - Method to prepare alkyl xanthates of phenols - Google Patents

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9: Sodium ethyl xanthate | Revolv

Infrared spectra of Nujol mulls of several xanthates, oxyxanthates, and dixanthates are presented. Constancy of frequencies within each group is discussed, and correlation of these frequencies with molecular structure is attempted.

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