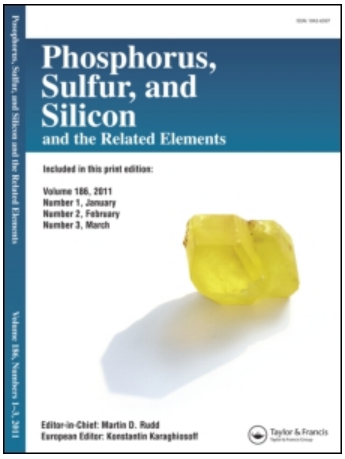
This article was downloaded by:
On: *28 January 2011*
Access details: *Access Details: Free Access*
Publisher *Taylor & Francis*
Informa Ltd Registered in England and Wales Registered Number: 1072954 Registered office: Mortimer House, 37-41 Mortimer Street, London W1T 3JH, UK



Phosphorus, Sulfur, and Silicon and the Related Elements
Publication details, including instructions for authors and subscription information:
http://www.informaworld.com/smpp/title~content=t713618290

Production of Sulfur-Containing Polymers on the Basis of Petroleum Refining and Chloroorganic Wastes

Alexey K. Khaliullin; Kseniya S. Trofimova; Mikhail G. Voronkov

To cite this Article Khaliullin, Alexey K. , Trofimova, Kseniya S. and Voronkov, Mikhail G.(1999) 'Production of Sulfur-Containing Polymers on the Basis of Petroleum Refining and Chloroorganic Wastes', Phosphorus, Sulfur, and Silicon and the Related Elements, 153: 1, 421 — 422
To link to this Article: DOI: 10.1080/10426509908546501
URL: http://dx.doi.org/10.1080/10426509908546501

PLEASE SCROLL DOWN FOR ARTICLE

Full terms and conditions of use: http://www.informaworld.com/terms-and-conditions-of-access.pdf

This article may be used for research, teaching and private study purposes. Any substantial or systematic reproduction, re-distribution, re-selling, loan or sub-licensing, systematic supply or distribution in any form to anyone is expressly forbidden.

The publisher does not give any warranty express or implied or make any representation that the contents will be complete or accurate or up to date. The accuracy of any instructions, formulae and drug doses should be independently verified with primary sources. The publisher shall not be liable for any loss, actions, claims, proceedings, demand or costs or damages whatsoever or howsoever caused arising directly or indirectly in connection with or arising out of the use of this material.

Phosphorus, Sulfur and Silicon, 1999, Vol. 153-154, pp. 421-422
Reprints available directly from the publisher
Photocopying permitted by license only

© 1999 OPA (Overseas Publishers Association) N.V.
Published by license under the
Gordon and Breach Science Publishers imprint.
Printed in Malaysia

Production of Sulfur-Containing Polymers on the Basis of Petroleum Refining and Chloroorganic Wastes

ALEXEY K. KHALIULLIN, KSENIYA S. TROFIMOVA and MIKHAIL G. VORONKOV

Institute of Chemistry, Siberian Division, Russian Academy of Sciences 1, Favorsky Str., 664033 Irkutsk, Russia

Downloaded At: 14:15 28 January 2011

The possibility of the simultaneous treatment of petroleum refining and chloroorganic wastes (COW) has been shown. COW are complex mixtures of organic polychlorides. At present there are no effective and ecologically safe methods of COW remaking in the industrial practice. In fact, COW combustion or burial are used. Both are ecologically dangerous and can be used only as temporary measures.

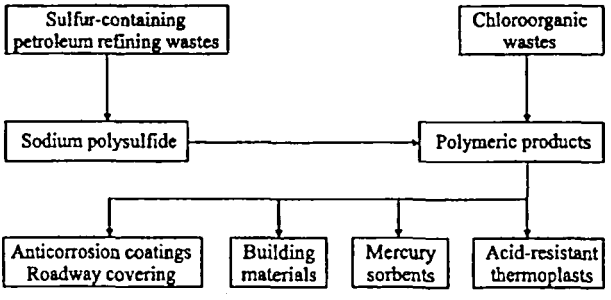
The proposed treatment is based on the polycondensation of a mixture of organic polychlorides with sodium polysulfide. The latter can be produced from petroleum refining wastes (gas sulfur, H_2S, alkaline solutions discharged after H_2S absorption, *etc.)*. Variation of the reaction conditions allows binding of any chloroorganic compounds to polymer structures. As a result the COW toxicity is eliminated. The principal factor determining the choice of reaction conditions is the COW composition, namely, the content of chlorobenzenes and chloroethylenes. It is known that the nucleophilic substitution of chlorine atoms in alkane derivates proceeds readily. At the same time chlorobenzenes and chloroethylenes are poorly active in these reactions.

For these reasons the treatment of COW containing mainly chloroalkanes (vat residues of vinyl chloride production, for example) does not encounter particular difficulties. The reaction of these wastes with aqueous sodium polysulfides at a temperature below 100 °C leads to the formation of rubber-like products. The treatment of COW containing considerable amounts of benzene and ethylene chlorides (the heavy fraction of epichlorohydrin production wastes, which contains up to 50 % of hexachlorobenzene, for example) presents a more serious problem. The chlorine nucleophilic substitution in the aromatic compounds can be carried out in dipolar aprotic solvents (DAS). However these reactions need high temperatures.

The use of phase transfer catalysts (PTC) allows the reaction to be carried out under mild condition (60-95 °C) without DAS. Tetraalkyl ammonium derivates or water-soluble polycations with quaternary nitrogen atoms in the macromolecular units, such as polydimethyl diallyl ammonium chloride , for example, can serve as PTC. The catalyst expenditure is 0.5-3.0 % of the COW mass. The sodium polysulfide/COW ratio is a very important factor of the proposed process, which should be not less than 10 mol/kg. Otherwise the polymer yield and degree of chlorine substitution decrease in several times. The polymers obtained by sulfidizing of the wastes of epichlorohydrin production contain up to 85 % of sulfur. They are thermoplastic even at high degrees of chlorine substitution (the initial and residual chlorine content is 80 nd 5 %, respectively). This is explained by the cyclic-chain structure of these polymers.

The polymers obtained can be compatible with polyvinyl chloride, epoxide compounds, and solid bitumens. As a result, this leads to an increase in acid-resistance of the polymer compositions and the heat distortion temperature of solid bitumens and to a decrease in expenditure of the epoxy resin hardeners. These polymers eliminate mercury and its compounds from water and gases. The sorptive capacity of these polymers achieves 180 mg Hg per 1 g.

The scheme below demonstrates the possibility of the treatment of the petroleum refining and the chloroorganic wastes.



ACKNOWLEDGEMENT

This work was supported by the State Scientific-Technical Program "Ecologically safe processes of chemistry and chemical engineering" (Project 4.6.4518)

Downloaded At: 14:15 28 January 2011