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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>

Amides of the Hypophosphorous Acid: Some Properties and Application

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To cite this Article Deveixsiev, I. and Borissov, G.(1990) 'Amides of the Hypophosphorous Acid: Some Properties and Application', *Phosphorus, Sulfur, and Silicon and the Related Elements*, 51: 1, 284

To link to this Article: DOI: 10.1080/10426509008040818

URL: <http://dx.doi.org/10.1080/10426509008040818>

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AMIDES OF THE HYPOPHOSPHOROUS ACID: SOME PROPERTIES AND APPLICATION

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The interaction of 50% aqueous solution of hypophosphorous acid (HPA) with some aromatic and aliphatic isocyanates (phenylisocyanate (PIC), 2,4-toluylenediisocyanate (TDI), butylisocyanate (BIC), and 1,6-hexamethylenediisocyanate (HMDI)) was investigated. PIC reacts only with water present in the system, yielding N,N-diphenylcarbamide. The interaction with TDI also leads to compounds possessing P-C bond. Their structure has been determined by IR- and NMR-spectroscopy. The interaction with aliphatic isocyanates proceeds mainly between the isocyanate groups and the acid P-OH group of HPA. Amides of HPA are obtained: N-butylphosphamide and 1,6-N,N-hexamethylenediphosphamide. The structure of these compounds has been determined by IR-, ^1H -, and ^{31}P -NMR-spectroscopy. 1,6-N,N-hexamethylenediphosphamide condenses with formaldehyde, yielding an oligomeric product. The reaction proceeds mainly at the phosphamide groups, but it has been established by ^1H - and ^{31}P -NMR spectra, that the hydrogen atoms at the phosphorus also take part in the interaction. The prepared oligomer has also been characterized by gel-permeation-chromatography. It possesses growth-regulating and cytokininic activity. 1,6-N,N-hexamethylenediphosphamide has also been tested as a fire retardant for rigid polyurethane foams.