

value and the heat of formation of crystalline polyoxymethylene (-40.93 kcal per CH_2O unit) obtained by Parks and Mosher¹⁰. These yield the value -23.2 kcal mole⁻¹ for the heat of formation of formaldehyde. It is believed that this figure is more reliable than the presently accepted 'best' value for this quantity.

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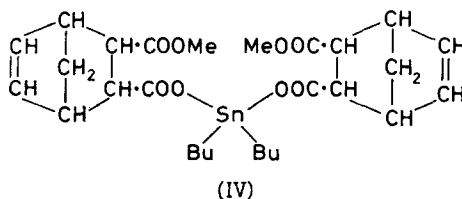
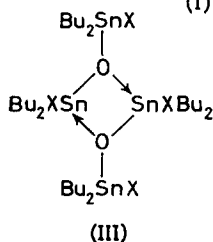
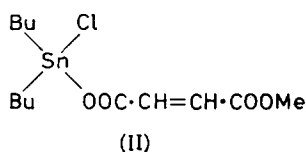
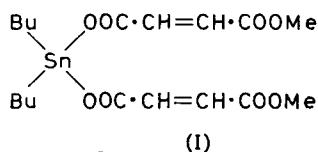
(Received July 1966)

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The Stabilization of Poly(vinyl chloride) by Organotin Maleates

ORGANOTIN derivatives of maleic acid are widely used to inhibit degradation of poly(vinyl chloride) by heat and light¹. It has been suggested¹ that these compounds undergo Diels-Alder addition reactions with diene systems in the partially degraded polymer chains. There is no direct evidence for this and many of the stabilizers have been only vaguely described in the patent literature and are of uncertain composition.



In recent work² on the mechanism of stabilization of poly(vinyl chloride) dibutyltinbis(methyl maleate) (I), prepared³ from dibutyltin dichloride and potassium methyl maleate, was used but no details of this compound were reported.

An attempt to repeat this preparation gave dibutylchlorotin methyl maleate (II), m.pt 41° to 43°C as the sole product. Compound I was, however, prepared from dibutyltin oxide and methyl hydrogen maleate and isolated as an oil n_D^{25} 1.4930 which could not be distilled without decomposition. An attempt to convert I to its 2,2'-bipyridyl derivative using the aqueous ethanolic conditions described by Huber *et al.*⁴ caused hydrolysis to (III, X=OOC·CH=CH·COOMe) m.pt 91° to 94°C (similar compounds where X=CH₃·COO are well known⁵). Compound I interacted with dienes such as 2,3-dimethylbuta-1,3-diene but the products were gums and difficult to purify. However, with cyclopentadiene the crystalline Diels-Alder adduct IV m.pt 56° to 58°C was obtained.

Further studies on the mechanism of stabilization of poly(vinyl chloride) by organotin compounds are in progress.

(All the compounds described had satisfactory elemental analyses and infra-red spectra; compound III had molecular weight (found) 1450, (required) 1480.)

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(Received October 1966)

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