

## A Novel Synthesis of Eight-Co-ordinate Tin(IV) Compounds

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INTEREST in the principles that govern the stereochemistry of tin(IV) compounds has led to the synthesis of four-, five-, and six-co-ordinate compounds by various workers.<sup>1</sup> Although a few examples of eight-co-ordinate tin are reported, including  $[\text{Sn}(\text{C}_2\text{O}_4)_4]^{4-}$ <sup>2</sup> and tin(IV) phthalocyanin,<sup>3</sup> the paucity of such compounds has occasioned our present interest, and we now report a novel method of synthesis of eight-co-ordinate tin(IV) complexes: tin-phenyl cleavage of organotin-chelate compounds by chelating agents.

As an example of the method, tetrakis-(8-quinolinolato)tin(IV) was prepared by heating a mixture of diphenylbis-(8-quinolinolato)tin(IV)<sup>4</sup> (5 mmoles) and 8-quinolinol (12 mmoles) at 300°. Benzene was distilled off, and the residue was purified by washing with ether, then with boiling toluene to obtain a brick red crystalline product (21%), m.p. >400°. The compound was further purified by vacuum sublimation.

That this is an eight-co-ordinate tin(IV) compound is indicated by the following information: (1) the compound is a non-electrolyte in nitrobenzene ( $0.3 \times 10^{-3}\text{M}$ ) and does not have the

structure  $[\text{Sn}(\text{Ox})_3]^+\text{Ox}^-$ ; (2) the compound is monomeric [Found:  $M$  (Rast in acridine), 760. Calc.:  $M$ , 696] the insolubility in other solvents precluded molecular-weight determinations by cryoscopic or ebullioscopic methods; (3) polarographic measurements of dimethyl sulphoxide solutions indicate that the two- and four-electron reduction potentials are the same for the complex and for diphenyltin dichloride; (4) that the 8-quinolinolato ligands are truly bidentate is indicated by the thermal stability in boiling toluene, by the infrared absorption spectrum of the complex which showed a weak absorption at  $418 \text{ cm.}^{-1}$  diagnostic of co-ordination of the ring nitrogen to tin,<sup>5</sup> and the failure of methyl iodide to form a quaternary nitrogen (conductometric titration in nitrobenzene).

The use of tin-phenyl cleavage by appropriate chelating agents appears to offer a novel and convenient route to the synthesis of eight-co-ordinate tin compounds.

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<sup>3</sup> P. A. Barrett, C. E. Dent, and R. P. Linstead, *J. Chem. Soc.*, 1936, 1733.

<sup>4</sup> W. H. Nelson and D. F. Martin, *J. Inorg. Nuclear Chem.*, 1965, **27**, 89.

<sup>5</sup> I. R. Beattie and G. P. McQuillan, *J. Chem. Soc.*, 1963, 1519.