A Molybdenum Complex Containing Molecular Nitrogen

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Summary A molybdenum–nitrogen complex has been prepared for the first time from molecular nitrogen.

SOME nitrogen-fixing enzymes in biological systems contain molybdenum, nonhaeme iron, and labile sulphide.[1] We have now prepared and isolated a molybdenum–nitrogen complex. When nitrogen gas was bubbled through a toluene solution containing molybdenum(III) acetylacetonate, triphenylphosphine, and tri-isobutylaluminium for several days, a small amount of an orange complex precipitated. The complex was moderately air-stable and sparingly soluble in toluene, acetone, and tetrahydrofuran. Elemental analysis indicated the presence of nitrogen (*ca.* 3·8%). Molybdenum was detected qualitatively. Thermal decomposition occured *in vacuo* above *ca.* 120° with evolution of a gas consisting of nitrogen, benzene, and a trace amount of hydrogen. The i.r. spectrum of the complex showed a very strong absorption at 2005 cm.$^{-1}$ assignable to the co-ordinated N–N stretching vibration, in addition to bands characteristic of triphenylphosphine. No absorption bands attributable to Mo–H stretching vibration were observed, but the presence of benzene and a trace amount of hydrogen in the decomposed gas may indicate an Mo–H bond. Experiments are now in progress to determine the structure of the molybdenum–nitrogen complex and to explore the possibility of reducing the co-ordinated nitrogen.

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[1] R. W. F. Hardy and R. C. Burns, *Ann. Rev. Biochem.*, 1968, **37**, 331.