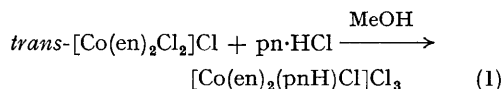


Chloropentaminecobalt(III) Complexes Containing Monodentate Propylenediamine

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USING a modification of established methods for preparing *cis*-chloro(amine)bisethylenediaminecobalt(III) complexes,¹ we have prepared an isomeric mixture of complexes formulated as $[\text{Co}(\text{en})_2(\text{pnH})\text{Cl}]\text{Cl}_3$ * (reaction 1). The complexes

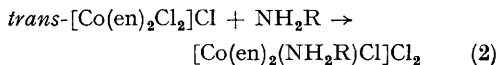


are unique in two ways. Firstly, each contains propylenediamine functioning as a monodentate ligand; and secondly, each has a cationic charge of 3+ rather than 2+ which is the normal charge for chloropentaminecobalt(III) complexes.

Elemental analysis of the mixture is in accord with the above formulation, and an aqueous molar conductivity of 401 $\text{cm}^2 \text{ohm}^{-1}$ (0.001 M, 25°) substantiates that the complexes are tri-univalent electrolytes. The presence of a single uncoordinated amine was verified using the method of Phillips and Royer.²

For complexes of the formulation $[\text{Co}(\text{en})_2(\text{pnH})\text{Cl}]\text{Cl}_3$, three types of isomerism are possible: geometric, optical (both antipodic and diastereomeric), and linkage. A kinetic study of the

mercury(II) ion-induced aquation of $[\text{Co}(\text{en})_2(\text{pnH})\text{Cl}]\text{Cl}_3$ has substantiated that the material is an isomeric mixture. The method of preparation together with a very close visible spectral similarity between the mixture and *cis*- $[\text{Co}(\text{en})_2\text{NH}_3\text{Cl}]\text{Cl}_2$ indicates that isomers having the *cis*-configuration predominate.† The mixture prepared using *laevo*-propylenediamine, $[\text{Co}(\text{en})_2(-)\text{pnHCl}]\text{Cl}_3$, exhibits little optical rotation at the sodium D-line ($[\alpha]_D = 0 \pm 11^\circ$). This indicates the presence of nearly equal amounts of *cis*-diastereomers since one antipode of the ammonia analogue, *D-cis*- $[\text{Co}(\text{en})_2\text{NH}_3\text{Cl}]\text{Cl}_2$, has a large rotation at this wavelength ($[\alpha]_D = +190^\circ$) and *laevo*-propylenediamine dihydrochloride exhibits a very small rotation ($[\alpha]_D = -4.0^\circ$). Co-ordination of propylenediamine primarily through the 1-amino-group is suggested by the observation that 1-aminoalkanes react more readily according to reaction (2) than do 2-aminoalkanes.^{1b,3}



Work is presently under way to separate and characterize the individual isomers.

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* en is ethylenediamine; pnH is monoprotonated propylenediamine.

† For $[\text{Co}(\text{en})_2(\text{pnH})\text{Cl}]\text{Cl}_3$, $\lambda_{\text{max}} 527 \text{ m}\mu$ ($\epsilon 74$) and $367 \text{ m}\mu$ ($\epsilon 82$); for *cis*- $[\text{Co}(\text{en})_2\text{NH}_3\text{Cl}]\text{Cl}_2$, $\lambda_{\text{max}} 525 \text{ m}\mu$ ($\epsilon 73$) and $367 \text{ m}\mu$ ($\epsilon 77$).

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² J. F. Phillips and D. J. Royer, *Inorg. Chem.*, 1965, **4**, 616.

³ M. D. Alexander and D. H. Busch, unpublished results.