Neutral molecules (diamines, water) in all above mentioned selenocyanate compounds are bonded only to the Cu(II) atoms. In mixed valence complexes (I) and (II) the Cu(II) atom has square pyramidal coordination. In copper(II) selenocyanate complexes central atoms are surrounded by a distorted octahedron. The calculated interatomic distances $\text{Cu}_2\text{N}_o \ldots \text{N(en)}$ and SeCN...N(en) suggest the presence of hydrogen bonds.

An investigation of the europia-zirconia binary system has been made to parallel one already reported for the europia-hafnia system (I. F. Ferguson and Miss L. Hammonds (1978) Acta Cryst. A34, 8154-8155).

Mixed oxides were prepared as follows. The mixed 'hydroxides' were precipitated by the addition of excess ammonium hydroxide to a solution containing 0.55 g/ml made up from Spepure zirconyl chloride octahydrate dissolved in dilute hydrochloric acid and Spepure europium dissolved in concentrated aniler nitric acid. Excess ammonia was removed by boiling, while the volume of solution was maintained constant by the addition of demineralised water, the precipitate was filtered off, dried at 110°C, lightly ground, transferred to an alumina boat, heated to 500°C for 10 h in air, then to 1300°C for a further 10 h in air and cooled slowly to room temperature. A portion was then removed for X-ray powder diffraction analysis. The remainder was reheated to 1550°C for 10 h and allowed to cool slowly to room temperature. The resultant mixed oxides were examined using an XAO focussing camera set for pure CuKα radiation. A duplicate sample was examined similarly but with added XMS standard silicon as an internal standard. Lattice parameter measurements were made using a Hilger and Watts measuring rule and all computations made using a Fortran version of the program FINSTAR (G. Astle and I. F. Ferguson (1970) UKAEA Report TM 1812).

All sample compositions were determined by X-ray fluorescence analysis and are correct to ± 0.1 mole %. In samples prepared at 1300°C it was found that b.c.o. europia could dissolve up to about 5 mole % zirconia when its cubic cell edge, a, decreased to 10.83Å. Between 9.6 and 39.8 mole % zirconia a two-phase region containing b.c.o. and f.c.o. (pseudo-fluorite) phases occurred. The cell edge of the f.c.o. phase was about 5.336 Å.

Between 39.8 and 84.8 mole % zirconia a range of f.c.o. solid solutions existed with cell edges which decreased continuously from 5.351 to 5.165 Å. However, some evidence was obtained for the existence of ordered structures as reported for the europia-hafnia system (I. F. Ferguson and Miss L. Hammonds) at 89.2 and 90.6 mole % zirconia both the f.c.o. phase and a phase based on tetragonal zirconia, with $a = 5.088 ± 0.004$ Å, $c = 5.1836 ± 0.0006$ Å, were present. However, at 93.6 mole % zirconia the only phases present were indistinguishable from tetragonal and monoclinic zirconia.

Results obtained on samples heated to 1550°C were essentially the same as those reported above except that there seemed to be a greater tendency for the formation of ordered f.c.o. structures based upon the fluorite lattice. This ordering was evidenced by the same a value occurring in samples which differed in composition by 6 or even 12 mole %. In addition some samples heated at 1550°C displayed faint additional diffraction lines which indicated contamination of the f.c.o. phases by one of two phases characterised by d spacings of 0.1, 0.39, 2.00 and 1.76 Å as well as 3.75, 2.82, 2.14, 1.85 and 1.65 Å. Time did not allow a full investigation to be made of these 'contaminants' but they were not the Ni and H2 phases reported by Kiparisorv et al. (8, 8, Kiparisorv et al. (1976) Izvestiya Akad. Nauk SSSR, Neorganicheskie Materialy, 25 (3) 1693-1694).