Abstand Kohlenstoff–Schwefel 4,1 Å. Bei dieser Berechnung wurde die von Hertel (1931) vorgeschlagene Atomanordnung und die von West (1937) für wahrscheinlich gehaltene Raumgruppe C_{3v}^5–$R3m$ zugrunde gelegt. Der Wert weist auf eine starke Annäherung des S_8-Ringes an das Jodatom hin, wenn vorausgesetzt wird, dass in dieser Additionsverbindung die Abstände im Jodoformmoelkül selbst nicht wesentlich verändert werden. Diese Annäherung lässt auf starke Bindungskräfte zwischen dem Jodatom und dem gesamten S_8-Ring schliessen.

Aufgrund unserer Intensitätsmessungen sind die erforderlichen Berechnungen zur genauen Festlegung der Atomlagen im Gange.

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A geometrical relationship between UC_2 (tetragonal) and U_2C_3 (cubic).

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Geometrical relationships between the structures of the phases involved in martensitic transformations have led to the phenomenological theories of Wechsler, Lieberman & Read (1953), Bowles & Mackenzie (1954) and Bilby & Frank (1960). These theories make use of a homogeneous shear on one plane to derive the lattice of the transformed phase from the parent phase, but such a shear does not carry the atoms to their final positions in the martensitic structure, and a further heterogeneous strain is included to make the fit. Chang (1961) has discussed the diffusionless transformation from UC_2 (cubic) to UC_2 (tetragonal) in terms of these theories, and the bearing that this has on the problem of the miscibility of UC and UC_2.

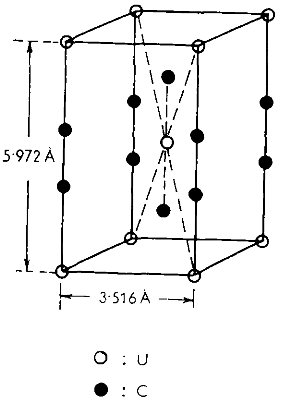

Fig. 1. UC_2 body centred tetragonal.

In certain circumstances it may be permissible to view diffusion-controlled transformations in an analogous way, as Bowles & Barrett (1952) have suggested. The framework of heavy atoms undergoes a deformation comparable to that in diffusionless transformations, and the light atoms diffuse to new positions relative to it.

The uranium–carbon system provides an example of such a transformation. Consider the relationship between tetragonal UC_2 (b.c.t.) and U_2C_3 (b.c.c.). Tetragonal UC_2 (Fig. 1) has two uranium atoms and four of carbon in a unit cell (Litz, Garrett & Croxton, 1948); Wilson (1960) gives $a = 3{\cdot}516$ Å, $c = 5{\cdot}972$ Å at room temperature. The U_2C_3 phase has a much larger unit cell (Fig. 2) containing sixteen uranium atoms and twenty-four of carbon (Mallett, Gerds & Vaughan, 1951), with $a = 8{\cdot}09$ Å (Wilson, 1960), and it seems to be quite complex and distinct from the UC_2 phase. Nevertheless this structure can be related to the simpler tetragonal one if the latter is given a homogeneous shear and a slight adjustment of the uranium atoms in which each moves by the same amount, namely about 0·7 Å. In the description which follows, only the positions of the uranium atoms are considered. These are the atoms which determine the framework of the two structures, the carbon atoms diffusing during the transformation to new positions and forming the stoichiometric relationship.

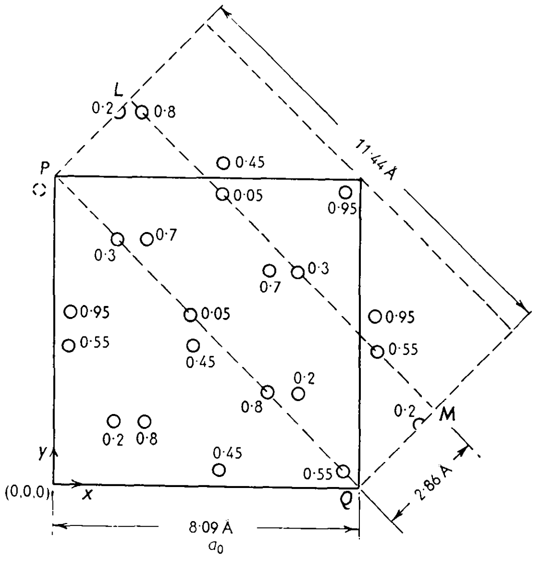

Fig. 2. Uranium atoms in the U_2C_3 cubic cell. Numbers refer to the Z axis coordinates, perpendicular to plane of paper, in fractions of a_0.

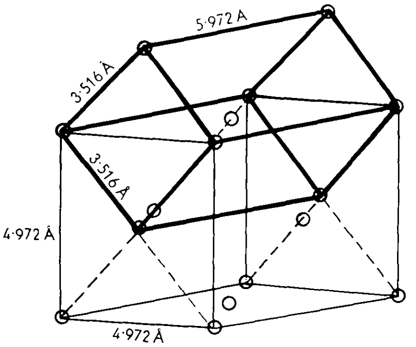

Fig. 3. Uranium atoms in the UC_2 tetragonal cell.

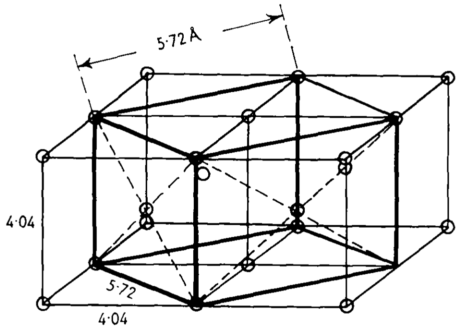

Fig. 4. Transformation to body centred cubic by homogeneous shear.

In Fig. 3 the thick lines denote a body-centred tetragonal UC_2 cell with the uranium atoms shown in their positions on the lattice. By a suitable homogeneous shear (001) [100], the tetragonal prism shown by thinner lines can be transformed to another prism of dimensions $4{\cdot}04 \times 5{\cdot}75 \times 5{\cdot}97$ Å. This is equivalent to changing the square small face of the UC_2 cell into a rhomb of angle 70°. The construction in Fig. 4 shows that by a rotation of two axes by 45°, the structure becomes body-centred cubic with a cell edge of 4·04 Å, following a slight contraction of the long axis.

This has not quite reached the U_2C_3 structure (Fig. 2) however, but the U_2C_3 structure could be converted into the b.c.c. structure by giving it a parameter $x = 0{\cdot}25$ instead of $x = 0{\cdot}20$. This is equivalent to moving each uranium atom by $0{\cdot}05 \times \sqrt{3} \times 8{\cdot}09 = 0{\cdot}7$ Å.

This transformation could thus be regarded as one in which there is little or no interchange in the positions of neighbouring uranium atoms, a feature which is normally regarded as a characteristic of martensitic transformations. It may be noted that although this change of structure bears a close resemblance to the well known kinds of martensitic transformations (see, for example, Bilby & Christian, 1956), a b.c.t. to b.c.c. transformation is rather uncommon in this field. It would be interesting to see if habit-plane relationships can be found experimentally for the UC_2/U_2C_3 transformation, although it is one which proceeds by nucleation and growth of the new phase, and goes to completion isothermally; the movement of carbon atoms by interstitial diffusion may alone be responsible for this. Another feature which this transformation has in common with martensitic ones is that some cold working as well as heat treatment appears to be desirable to form U_2C_3.

The UC structure, which is cubic, can also be related to the UC_2 tetragonal structure by a rotation of 45° and an extension of some 20% in the [100] direction, carbon atoms moving into the spaces associated with the extension.

Thus all the uranium–carbon compounds can be regarded as structures containing carbon atoms arranged in the interstices of approximately similar networks of uranium atoms. The possibility that a whole range of non-stoichiometric compounds occurs should not be overlooked.

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Dendritic crystals of cubic (Ba, Bi)FeO_3.

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Recent studies (Tauber, Savage, Gambino & Whinfrey, 1962) at this Laboratory have concerned the growth of large crystals of hexagonal ferrites for microwave applications. The work has involved synthesis of such phases as $Ba_2Zn_2Fe_{12}O_{22}$, $BaZn_2Fe_{16}O_{27}$ (known as Zn*Y* and Zn*W*, respectively; Braun, 1957), etc., by slow-cooling melts containing fluxes of Na_2FeO_4 and Bi_2O_3. While using the latter flux in the growth of Zn*Y*, minute