

actively, in spite of the grain size was in turning on the and-operated on a tor. radially columnar (6, 7 and 8). These concentration of rod axis, giving a is unusual for temperatures in the conditions {010} poles the rod axis. Work shown that alpha thermal gradient growth the {100} poles direction of the axial texture in be a consequence re. The unusual in the quenched effect of the steep during quenching. "ure" rods can also illustrated in the uranium-0.16 wt % red to the larger alloyed rod no. 3 conditions. The rim can be con- of the billet before (20 and 21) were extrusion container s in contact with for 3 sec longer an was the front ne-grained rim on nately twice the rim on the front

by a separate post-extrusion beta treatment. This beta structure may be present throughout the rod or it may constitute a core surrounded by a rim of fine-grained material, which has not transformed into the beta phase. This rim thus has a preferred orientation and also very fine grains; the latter may help minimize in-pile bumping of the surface by the coarse core grains. The thickness of the fine-grained rim can be controlled through cooling of the rim of the extrusion billet, e.g. through contact with the extrusion tools.

The beta-treated structure achieved directly by extrusion is presumably suitable for isotropic behavior under irradiation. The tendency for surface bumping can be reduced by the fine-grained rim achievable in the same extrusion

operation. Such a rim may be unnecessary if the core is alloyed to obtain a finer grained all-beta structure.

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e selected so that transforms to the die and thereby narily is achieved