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Structure and properties of titanium produced by a new method of chip recycling

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Abstract. The paper proposes a new technique of recycling metallic chips and presents the results of examination of the products thus obtained. The aim of the experiments was to recycle commercial purity (cp) titanium Grade 2 chips obtained by turning, and to produce a solid bulk material. The recycling was realized using a plastic working process. The titanium chips were first subjected to preliminary consolidation and then directly extruded using the KOBO process. The properties of the recycling final product were examined and compared with those of the as-received, solid cp-titanium Grade 2 (reference material).

The recycling process yielded a well consolidated solid titanium rod with a diameter of 8mm. The consolidation effect was high which was confirmed by the fact that only a small number of voids and discontinuities distributed randomly were observed. The final material had a homogeneous grained structure. The equiaxial grains observed on the transverse and longitudinal sections had similar sizes. The mechanical properties of the recycled material (estimated based on the results of microhardness measurements and uniaxial compression tests) were comparable with those of solid cp-titanium Grade 2.

Keywords: recycling; titanium; chips; plastic forming; KOBO method