Abstract Submitted
for the SHOCK09 Meeting of
The American Physical Society

Dislocation density in copper and tantalum after shock loading up to 20-100 GPa ALEXEY PODURETS, MIKHAIL TKACHENKO, VIKTOR RAEVSKY, OLGA IGNATOVA, RFNC-VNIIEF, MARVIN ZOCHER, LANL, USA — Dislocation density was investigated by X-ray radiography method in recovered copper samples having grain sizes of 0.5 and 30μm after loading by shock waves with amplitudes of 30-60GPa, and in tantalum after loading up to 20-100 GPa. The highest value was recorded in 30 μm copper loaded by pressure of $50 GPa$, namely, it was $5{\cdot}10^{11} cm^{-2}$. In ultrafine-grain copper (UFG) with grain size of 0.5μm, which had the highest initial dislocation density ($1.8{\cdot}10^{11}$ cm^{-2}), it was possible to observe relatively small increment of dislocation density up to the values of $\sim 3{\cdot}10^{11}$ cm^{-2} at $P\sim$40-50 GPa. In all samples, the maximum was revealed in the range of 40-50GPa followed by drop. The authors explain this drop by annealing of defects at adiabatic heating caused by compression. The sharpest drop of dislocation density was observed in UFG copper, since the most deformed and nonequilibrium initial structure took place in it. In tantalum, monotonous growth of dislocation density was recorded up to the value of $\sim 3{\cdot}10^{10}$ cm^{-2} as pressure grew in shock wave. Comparison of the obtained data with results of the earlier measurements of density of twins in copper shows that strength depends on presence of the both types of defects in a structure.

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Date submitted: 13 Feb 2009 Electronic form version 1.4