Laser shock wave loading of the vanadium and titanium

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Investigation of elastic and plastic wave propagation and attenuation thru the thickness of the material is very important for the Laser Shock Peening (LSP) surface treatment [1] We have tested disk-shaped specimens 1 mm thick and 13 mm in diameter. Specimens were loaded by Beamtech SGR-Extra-10 Nd:YAG pulse laser Type: Nd:YAG wavelength: 1064nm pulse duration: 11ns pulse energy up to 10J Specimens made of vanadium and titanium were covered by a sacrifice layer of aluminum foil so the microstructure of the specimen was not affected by laser radiation. To increase wave amplitude the sacrifice layer was covered by a thin water layer. The water layer should be thin because of the absorption of the IR radiation in the water. At the first experiments, we did not observe any spallation, and wave amplitudes were lower than presented in [1]. We suppose that it is due to the acoustic impedance mismatch between the aluminum sacrifice layer and the specimen material. But the structure of the surface layer was changed. We observed grain fragmentation and other signs of severe plastic deformation. This work was supported by RSCF grant No. 21-79-30041

[1] Seddik R, Rondepierre A, Prabhakaran S, Morin L, Favier V, Palin-Luc T and Berthe L 2022 *European Journal of Mechanics - A/Solids* **92** 104432