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Effects of Titanium Nitride Surface Coating on High Speed Impact Induced Damage of Magnesium Alloys at Cryogenic Temperature
K. TAKAYAMA, D. NUMATA, Tohoku Univ., R. KUBOTA, A. SHIMAMOTO, Saitama Inst. Tech — This reports a summary of our recent high speed impact tests aiming to clarify the impact characteristic of magnesium alloy with titanium nitride coating. We placed 100 mm x 100 mm and 3 mm thick magnesium alloy plates, ZK60A-T5 at 298 K, 223 K and 153 K, which were coated with 1 micron thick titanium nitride layer based on a hollow cathode discharge method. We also tested with uncoated magnesium plates. The plates were impinged by 8 mm diameter aluminum alloy (Al2017-T4) spheres at impact speeds of 0.5 to 1.7 km/s in a two-stage light gas gun in the SWRC, IFS, Tohoku Univ. Two specimens were installed at 100 mm interval vertically to the spheres in a cryogenic test chamber [1]. Impact phenomena were visualized with shadowgraph arrangements and recorded with ImaCon 200. As a result, the effect of surface coating on surface fracture was examined. We found the increase of hole areas in proportional to the impact speed and a clear difference of penetration hole and fracture patterns between impact speed of 0.5 km/s and higher impact speeds. The titanium nitride coating was effective to favorably control the damage process. [1] Numata,D. et al., Shock Waves (2008), 18:169-183.

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