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A novel assembly used for hot-shock consolidation PENGWAN CHEN, QIANG ZHOU, Beijing Institute of Technology, STATE KEY LABORATORY OF EXPLOSION SCIENCE AND TECHNIQUE TEAM — A novel assembly characterized by an automatic set-up was developed for hot-shock consolidations of powders. The under-water shock wave and the high-temperature preheating, which are considered as two effective ways to eliminate cracks, were combined in the system. In this work, a SHS reaction mixture was used as chemical furnace to preheat the precursor powder, and the water column as well as the explosive attached to it was detached from the furnace by a solenoid valve fixed on the slide guide. When the precursor powders was preheated to the designed temperature, the solenoid valve was switched on, then the water column and the explosive slid down along the slide guide by gravity. At the moment the water container contacted with the lower part, the explosive was initiated, and the generated shock wave propagated through the water column to compact the powders. So the explosive and water column can be kept cool during the preheating process. The intensity of shock wave loading can be adjusted by changing the heights of water column. And the preheating temperature is controlled in the range of 700∼1300°C by changing the mass of the SHS mixture. In this work, pure tungsten powders and tungsten-copper mixture were separately compacted using this new assembly. The pure tungsten powder with a grain size of 2μm were compacted to high density (96%T.D.) at 1300°C, and the 90W-10Cu (wt pct) mixtures were compacted to nearly theoretical density at 1000°C. The results showed that both samples were free of cracks. The consolidated specimens were then characterized by SEM analysis and micro-hardness testing.

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