On the use of ultrasonic shot peening for modifying subsurface microstructure and surface reactivity.

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The failures of mechanical parts are often initiated from the surface which representsa specific zone subjected to particular solicitation conditions (ambient atmosphere, friction, wear, maximum loading stress é). With the view to reinforce the surface properties, several mechanical surface treatments have been developed. Among them, the Ultrasonic Shot Peening (USP), also known as Surface Mechanical Attrition Treatment (SMAT) [1], allows the generation of graded microstructures by numerous shot collisions having random impact trajectories inside a confined chamber. However, this technique remains a complex treatment due to the number of treatment parameters which include the deformation temperature during the process.

The purpose of this study is to document the effectiveness of a cryogenic USP treatment to modify the microstructures of austenitic stainless steels having different stabilities with regards to the martensitic transformation [2]. The effect of different treatment parameters (vibration amplitude, duration and temperature) on the formation of surface graded-structure will be discussed. Some insights will also be given concerning the effect of the cryogenic USP technique on the fatigue behaviors of the 316L austenitic stainless steel.

In addition, the potential of the surface activation by USP for improving the kinetics hydrogen sorption / desorption in vanadium based alloys used for solid state hydrogen storage will be highlighted [3].

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