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## **The Correlation Between Charpy Impact Testing and Hydrogen Charging in High Strength Steels**

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Ultra-high strength steel was charged by cadmium plating. The objective was to examine the effect of cadmium plate thickness and hence hydrogen on the impact energy of the steel. The AISI 4340 steel was austenitized at 1000 °C for 1 h, water quenched, and tempered at temperatures between 257 and 593 °C in order to achieve a range of targeted strength levels. The specimens were cadmium plated with 0.00508 mm (0.2 mils), 0.00762 mm (0.3 mils), and 0.0127 mm (0.5 mils). Results demonstrated that the uncharged specimens exhibited higher impact energy values when compared to the plated specimens at all tempering temperatures. The cadmium-plated specimens had very low Charpy impact values irrespective of their ultimate tensile strength values. The model of hydrogen transport by mobile dislocations to the fracture site appears to provide the most suitable explanation of the results.

[1] K. Mori, E.W. Lee, W.E. Frazier, K. Nigi, G. Battel, A. Tran, I. Iriarte, O. Perez, H. Ruitz, T. Choi, P. Stoyanov, J. Ogren, J. Alrashid, and O.S. Es-Said, Effect of Tempering and Baking on the Charpy Impact Energy of Hydrogen Charged 4340 Steel, NJMEPEG, 2015, 24, p 329–337

[2] J.K. Tien, A.W. Thompson, I.M. Bernstein, and R.J. Richards, Hydrogen Transport by Dislocations, Met. Trans. A, 1976, 7A, p 821–829