# Effects of Mechanical Stress on the Phase Stability in Metal-Hydrogen Systems

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Burning one gram of hydrogen produces much more heat than burning a gram of methane or gasoline. Burning hydrogen is much cleaner than burning methane or gasoline. The abundance of hydrogen in nature is much greater than those of methane or gasoline. So lets use hydrogen to satisfy a portion of our energy needs. That all sounds good, but how do we store hydrogen safely? How about in a metal or alloy?

Once absorbed in the metal matrix, hydrogen is stable and safe. However, absorption and desorption of hydrogen often has a significant effect on the mechanical properties of the metal matrix. Hydrogen embrittlement often diminishes the promise of metal-hydrogen systems. Are there metals and alloys available that do not suffer the detrimental effects of hydrogen embrittlement? Are there conditions under which a metal can absorb hydrogen and not suffer from hydrogen embrittlement? The answers to these questions is “maybe”. Our research has shown that a palladium-silver alloy composed of 25% silver will not undergo hydrogen embrittlement under any situations of hydrogen absorption! We have also found that we can control the onset of hydrogen embrittlement in other palladium-silver alloys! Is this unique to palladium-silver alloys? Stay tuned because we are working hard to answer that question.