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Helium in metals: interesting science in the national interest

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Many rare-earth and transition metals readily react with hydrogen to form distinct metal-hydrogen phases. While the hydrogen density of the rare-earth and transition metal hydrides is very high, their hydrogen mass density is very low. The low mass density makes them not suitable for use in automobile on-board hydrogen storage but they are excellent for long term hydrogen storage in situations where weight is not a factor. At Sandia National Laboratories, we are interested in storing the hydrogen isotope tritium. Tritium is interesting because it is radioactive, decaying into ³He with a half-life of 12.3 years. Helium is insoluble in metals and forms highly pressurized helium bubbles in the metal lattice while only a small fraction of the generated helium escapes from the metal. In this presentation I will share some of the interesting physics and chemistry that we have discovered about metal tritides and helium in metals.