HYDROGENATION OF $Zr_{0.9}Ti_{0.1}Cr_xFe_{2-x}$ INTERMETALLIC COMPOUNDS: FREE ELECTRON MODEL FOR MAGNETIC SUSCEPTIBILITY AND THERMOELECTRIC POWER

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ABSTRACT. The magnetic susceptibility and thermoelectric power of $Zr_{0.9}Ti_{0.1}Cr_xFe_{2-x}$ intermetallic compounds were investigated as functions of hydrogen content. The alloys are paramagnetic, with magnetic susceptibility and Seebeck coefficient increasing with the amount of stored hydrogen. The susceptibility is proportional to the Seebeck coefficient and to the d-electron concentration, consistent with a free-electron model. The susceptibility of alloys with lower iron concentration suggests exchange-enhanced Pauli paramagnetism. However, Curie-Weiss paramagnetism likely coexists in alloys with higher iron content. Magnetic and electronic measurements may be used to assess the ability of an alloy to store hydrogen.

Keywords: Electronic Band Structure, Hydrogen Storage Materials, Intermetallic Compounds, Magnetic Susceptibility, Metal Hydrides, Nondestructive Electromagnetic Testing, Pauli Paramagnetism, Phase Diagrams, Seebeck Coefficient, Thermoelectric Effects, Thermopower

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