

Preface

Excepting possibly at very high pressures in the megabar range, elemental hydrogen exists in the physical form of diatomic molecules. In this respect it exhibits an essential similarity to the halogen elements, and in further similarity to the halogens, hydrogen forms compounds of an essentially ionic type with the strongly electropositive alkali and alkaline earth metals. In these materials evidence seems consistent with the hydrogen being present in the form of anions or modified anions. It is an important feature of these non-metallic ionic hydrides that they all possess higher densities than their parent metals, except in the case of magnesium.

Although less electropositive than the alkali and alkaline earth elements, the *d* and *f* block transition metals still remain more electropositive than hydrogen. However, hydrides formed by the transition elements retain essentially metallic characteristics, and their formations are accompanied by decreases of density from those of the parent metals.

Under catalytically active surface conditions, crystallographically distinct metallic hydride phases are formed by transition metals of subgroups three, four and five at relatively low hydrogen pressures at ambient temperatures. The dependences of the compositions of these hydride phases on both temperature and hydrogen pressure (*p-c-t* relationships) and associated thermodynamic functions are centrally interesting features of metal/hydrogen systems; such derivations are experimentally convenienceed by comparatively high values of hydrogen diffusion coefficients.

A retained macroscopic cohesion by transition metal hydrides has proved valuable for relating accurate changes of hydrogen content to alterations of various structural, elastic, electronic and other physical properties.

