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主な研究成果

１．金属‐水素系物質の物性研究

水素を吸蔵した種々の結晶性金属合金の物性を内部摩擦，電気抵抗，X 線回折，熱分析等の実験手段を用いて多角的に研究した。それにより，金属合金中の水素原子の拡散や，水素と格子欠陥並びに不純物原子との相互作用などについて調べ，その原子論的機構を明らかにした。

＜主な論文＞ 22, 24, 30, 34, 36, 40, 45, 60, 83

２．水素を吸蔵したアモルファス合金の物性研究

水素を吸蔵した金属‐金属系アモルファス合金の原子的構造，結合状態，熱的安定性などについて，X 線回折，X 線分光（SXS），熱放出スペクトル（TDS）測定により研究した。それによって，アモルファス合金の構造‐結合状態‐熱的安定性間の相関関係に及ぼす水素の影響を明らかにし，その機構について検討した。

＜主な論文＞ 49, 50, 59, 80, 88, 90, 103

３．アモルファス合金並びに金属水素化物の電子状態の研究

金属‐金属系，金属‐メタロイド系，及び金属‐半導体系アモルファス合金の電子状態を軟 X 線分光（SXS）や光電子分光（XPS,UPS）測定で調べ，電子構造計算の結果と比較検討した。これにより，合金化やアモルファス化に伴う電子構造変化の特徴を明らかにした。また金属‐半導体系では，組成変化に伴う金属‐非金属遷移の発現過程を明らかにし，その機構について考察した。同様の手法で種々の金属水素化物の電子状態について調べた。特に発熱型水素化物では金属‐水素原子間の局所的な結合軌道の形成が重要であることを見出した。

＜主な論文＞ 16, 18, 27, 29, 31, 32, 46, 47, 82, 87, 92, 93, 96

４．高性能水素吸蔵合金の探索と機能発現機構の研究

高容量且つ高反応速度を有する水素吸蔵合金を開発する目的で，主にマグネシウム系合金の熱力学的特性，並びに合金構造と水素吸蔵放出特性との関係を調べた。本系合金では，溶融急冷でアモルファス化した後，結晶化させてナノ構造を形成することにより，優れた水素吸蔵機能が発現できることが分かった。その機構を高分解能電顕（HRTEM）等で明らかにした。

＜主な論文＞ 97, 98, 99, 100, 105, 110, 111

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