# 論文 / 著書情報
# Article / Book Information

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Solid hydrides containing hydride ion ($H^-$) as a constituent anion attract much attention for attractive properties, associated with the unique features of $H^-$, such as the charge and size flexibility, large polarizability, capability of electron-substitution, and orbital symmetry. A viewpoint from the electronic energy level provides a new guideline to design and understand hydrides. The objective of this thesis is to provide insight into the unique properties of $H^-$ in solid hydrides based on the electronic energy level alignment. Ionic and electronic carrier transport in rare-earth (*RE*) oxyhydrides was investigated. *RE* oxyhydrides crystalize in a fluorite-related structure. Their electronic structures are characterized by low work functions derived from electrons trapped at hydrogen vacancies and by shallow valence band maximum due to moderate electronegativity of hydrogen and strong anti-bonding interaction of 1s electrons of $H^-$. These oxyhydrides exhibit fast $H^-$ conduction, and their conductivities are tuned by the degree of oxygen substitution of hydrogen. Utilizing these properties, resistive switching driven by $H^-$ migration and their resistive random-access memory application were demonstrated. Finally, based on the appearance of mixed conduction via Fermi level shift dependent on the hydrogen chemical potential, the argument toward understanding the characteristic electrical properties of these oxyhydrides is founded on the energy level alignment.