Theory of Chemomechanics and Its Applications

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The complete fully coupling governing equations, including the heat conduction, mass diffusion and chemical reactions, are derived from the variational principles. The concentrations and entropy jump conditions on the moving interface between the products due to chemical reactions and the matrix are derived. Some examples, such as the oxidation, are discussed to demonstrate the application of the theory. The effects of creep and chemical reaction on the stress evolution during the oxidation are discussed. The proposed theoretical frame may pave the way for multi-physical-chemical-field coupling analysis, which is very important in many cases of modern science and technology, including modern integrated circuits, thermal protective systems and lithium ion batteries