Degradation and analysis of Solid Oxide Fuel Cells (SOFCs)

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In order to operate solid oxide fuel cells (SOFCs) for long-term, degradation of each components and interfaces must be clarified. For the degradation of real SOFC stacks and modules, several factors should be taken into account, such as 1) chemical reaction with impurity and components and 2) mechanical and electrical disconnection among cell components, etc. In this talk, chemical factors were especially considered. Durability tests of 4 stacks/modules were examined up to 5000-10000 h under constant current density. After long-term durability tests, the chemical degradation was especially investigated at cell components and interfaces of different materials. To detect small amounts of elements and reaction products, secondary ion mass spectrometry (SIMS) technique has been applied. We succeed in determining impurity level of several elements at each cell components for 4 types of stacks/modules. Some key elements associated with cell degradation were extracted from the impurity levels analysis and long-term operation test.