Fiscal Year 2013, Tokyo Institute of Technology ASPIRE League Research Grant

Selected Research Projects in FY2013

| | | |
|---|---|---|
| Principal Researcher | Name | **Masahiko YOSHINO** |
| | Department and graduate school(institute)in Tokyo Tech | Department of Mechanical & Control Engineering, Graduate School of Science and Engineering |
| | Position | Professor |
| Co-researchers | HKUST | ― |
| | KAIST | Im Yong-Taek,<br>Professor |
| | NTU | ― |
| | Tsinghua | Fang Gang,<br>Professor |
| Subject of the research project | | **Construction of Material Parameter Database for Crystal Plasticity FEM simulation.** |
| Summary of the research project | | CPFEM simulation is a powerful tool for the development of material properties of metallic materials. It is important to use reliable material parameters, i.e. critical shear stress, self-hardening rate, latent hardening rate, and interaction between slip systems, in order to improve the accuracy and reliability of the CPFEM simulation.<br>Since these material parameters cannot be measured directly by experimental methods, we should determine these parameters by means of the inverse analysis technique, in which we adjust the material parameters so that the simulation results correspond to the experimental results. Although these material parameters are usually determined by material tests of poly-crystal metals, it is very difficult to conduct exact CPFEM simulations of practical poly-crystal metals. As such, the material parameters obtained from a poly-crystal metal are not accurate.<br>In order to solve this problem, in this project, we will develop a |

| | |
|---|---|
| | systematic method to determine the accurate material parameters by using single crystal metal specimens.<br>A plane strain indentation test, a compression test, and a shearing test will be conducted using single crystal specimens having various crystal orientations. The load-deformation relationship and the crystal orientation map in the plastic deformation zone will be compared with the CPFEM simulation results. Pure iron will be employed as a representative bcc metal, and pure copper will be employed as a representative fcc metal. These experiments are to be conducted at Tokyo Tech.<br>CPFEM simulations are to be conducted at KAIST and Tsinghua University. They will develop CPFEM programs to simulate these material tests. They will also determine the material parameters by comparing simulation results with experimental results. Finally, these material parameters and simulation results will be summarized in a database of CPFEM simulations so that many researchers can utilize these material parameters. |