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Overlooking map of tribotechnology

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ABSTRACT – The Japanese Society of Tribologists (JAST) Technical Committee of Tribotechnology Roadmap is making the overlooking map of tribotechnology. The report shows briefly the structure and mechanism of the map and introduces the future tribotechnology requested by industries. The map has an effect to visualize the relation between the triboelements and tribosystems through the tribological issues to be solved. In addition, the map visualizes the application of fundamental tribology researches.

1. INTRODUCTION

One of the major roles of Japanese Society of Tribologists (JAST) is to present the tribological issues to be solved to individual and industrial members for inviting tribology-assisted, prosperous future. The Technical Committee of Tribotechnology Roadmap is making the Tribotechnology Overlooking Map for the purpose of linking the tribosystems such as cars, railway locomotives, ships, airplanes, space satellite, power generators, home electronics, machine tools and digital equipments, with the tribology elements such as bearings, seals, gears, lubricants, additives, frictional materials, coatings and surface treatments, via tribological- technological issues to be solved. This purpose comes from the fact that most of the issues are related to the tribology elements, and in addition, most of the industrial members belong to the element industries.

2. STRUCTURE AND FUNCTIONS OF THE MAP

Figure 1 shows the outline of the map. The map consists of horizontal (X), vertical (Y) axes and matrix area. The X axis represents the array of major or sub tribosystems to be developed or upgraded and Y axis represents the array of triboelements of today, and the matrix area is the table of the tribotechnological issues to be solved, which we are calling as 'Tribotechnology Matrix'. For example, the intersection of Tribosystem S and Triboelement E represents the tribological issue(s) to be solved by Triboelement E to develop or upgrade Tribosystem S. When you see the map downward from the system axis, you can find many tribological issues, then going leftward, you can also find the triboelement, namely the element industry, responsible for solving the issues. On the other hand, when you see the map rightward from the element axis, you can find many tribological issues, then going upward, you can find the system, which is developed or upgraded by solving the issues.

3. EXAMPLES

Examples of the effects and uses of the map for solving tribological issues, such as fuel consumption improvement at combustion engines of vehicles, lubrication under extreme environments of space satellite, and lower friction requirements by hard disk drives will be shown and discussed at the symposium.

Another example is to discuss the fundamental tribological issues such as requested to the simulation technology (Table 1) on the map, which visualizes the actual application (tribo-systems and tribo-elements) of the basic simulation technologies.

4. SUMMARY

Overlooking map of tribotechnology is introduced, and the effects and uses are shown and discussed. The map is in process of creation and updated day by day. Currently the map has 37 subsystems and 31 triboelements, and several hundreds of Matrix elements are filled with tribological issues. The map will be used for creating an accurate Tribotechnology Roadmap.

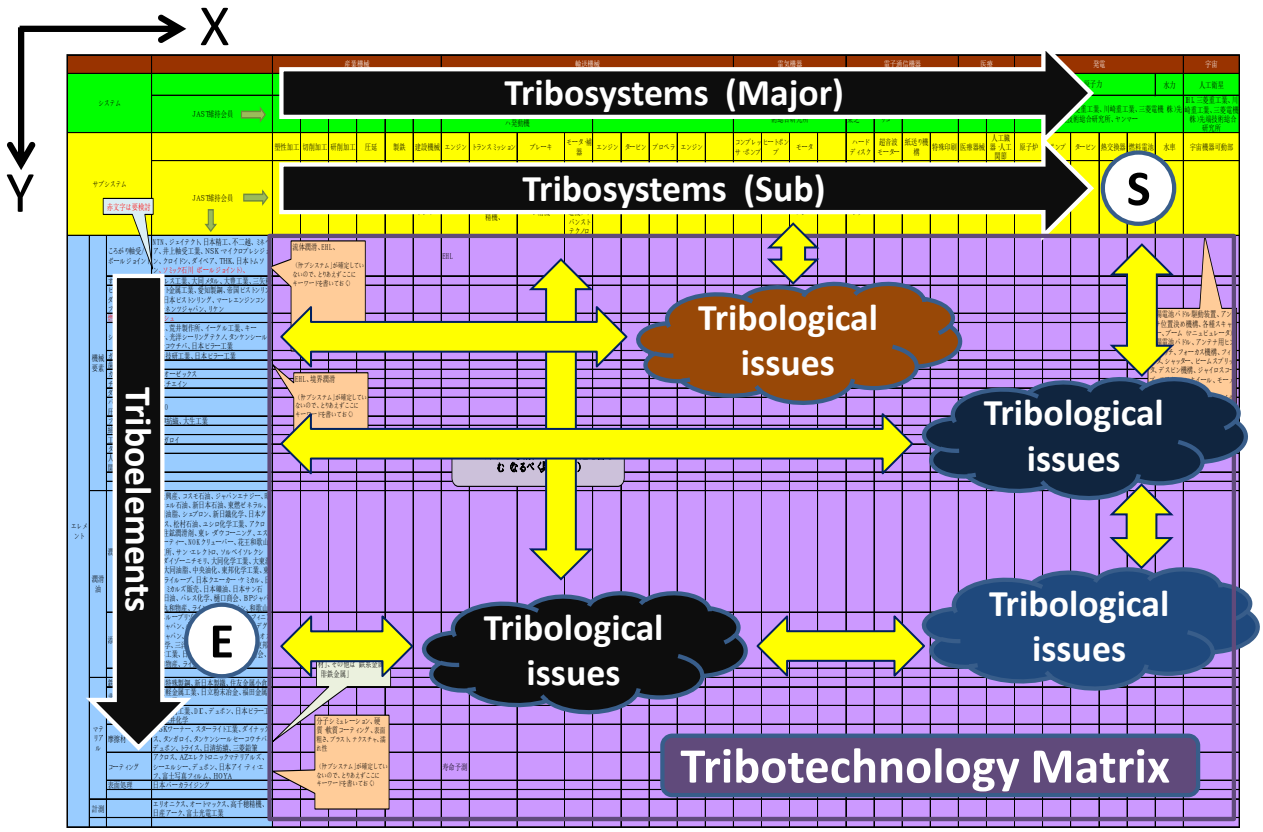

Figure1 Outline of overlooking map of tribotechnology

Table 1 Requested items to simulation technology

Research Area	Requested items to simulation technology	Applications
Hydrodynamic Lubrication	·Optimum design of surface textures and lubricant grooves ·Optimum design of mist lubrication ·Accurate prediction of oil amount	Engines, Pumps, Turbines, Generators, Bearings, Seals etc..
Boundary Lubrication	·Detail formation process of boundary lubricant film considering chemical reactions ·Accurate prediction for tribological properties of boundary lubricant film	Engines etc.
Lubricants, Grease and Additives	·Detail formation process of boundary lubricant film considering chemical reactions ·Prediction under extreme conditions	Engine oils, bearing lubricants etc.
Friction and Wear	·Accurate prediction at actual machine elements ·interaction between wear and friction ·Life prediction at actual machine elements	Bearings, Tires, Brakes etc.
Surfaces an Contact mechanics	·Accurate prediction of real contact ·Accurate prediction of junction growth ·Design of tribomaterials	Tires, Brakes etc.
Surface finishes and Coatings	·Accurate prediction of coating process ·Surface energy control by finish and coatings ·Design for multilayer coatings	Engines, Bearings etc.
Micro- and Nano-tribology	·Friction simulation for boundary lubrications considering tribochemical reactions	MEMS、Engines etc.