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Professor

Program: Advanced Materials Science and Technology

Area: Advanced Mechanical Science and Engineering

Undergraduate: Dept. of Mechanical and Production Eng.

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Professional Expertise

My major research field is called "Tribology". Tribology is the branch of science and technology concerned with interacting surfaces in relative motion, friction, wear, and lubrication. In this research field, my laboratory focuses on contact problems of the two solid surfaces such as contact stiffness, metal seal, measurement of real contact area and so on. Our research group has developed a new type of laser microscope having a wide field of view to observe a wide contact area at a time based on a unique technique of "shrink fitter".

Research Fields of Interest

Contact Stiffness

- Development of contact microscope

- Analysis of surface asperities

- Work-hardening effect

Laser Microscope having Wide Field of View

- Shrink fitter technique

- Optical lens and laser scanning method

- Observation of wide contact area

- Observation of cylindrical surfaces

Fine Laser Processing Machine for wide Area

- Scanning lens for high accuracy of laser spot location

- Surface texturing for high or low friction

- Selective laser sintering

- Laser therapy for birthmarks or tattoo

Contact Problems in Dye-Sublimation printers

- Analysis of contact pressure distribution

Education

1990: Doctoral Eng. degree, Tohoku University, Japan

1982: M.S. in Engineering, Graduate School, Tohoku University, Japan

1980: B.S. in Engineering, Dept. of Mechanical Engineering, Niigata University, Japan

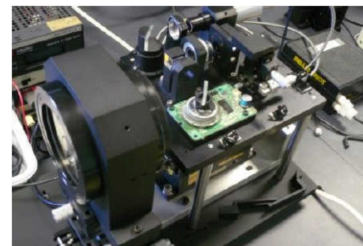


Figure: A newly developed laser microscope with a wide field of view of 50 mm by 40 mm by using Shrink Fitter technique that is invented by our laboratory



Figure: A cerebral aneurysm is the dilation, bulging, or ballooning out of part of the wall of a vein or artery in the brain. An aneurysm clip is a medical instrumentation that is used intraoperatively to clip a ruptured cerebral aneurysm and reduce the risk of rebleeding. To prevent the clips from slipping out of the blood vessels, a number of micro-dimples are formed on their clamp surfaces with a laser processing.

Professional Societies and Activities

1. Member of Japanese Society of Mechanical Engineers
2. Member of Japanese Society of Tribologists
3. Member of Japanese Society of Precision Engineers

Awards

1. Japan Society of Mechanical Engineers MDT Division Contribution Award, 2003
2. Technology Special Award at International New Technology Fair of the Nikkan Kogyo Shimbun Ltd., 2002
3. Japanese Society of Tribologists Research Encouragement Award, 1993

Major Publications

Papers

- [1] "Evaluation of tribological properties of pick up roller measured using a laser microscope with a wide field of view", *Tribology International*, vol.67, pp.182-190, 2013.
- [2] Thorough Observation of Real Contact Area of Copper Gaskets Using a Laser Microscope With a Wide Field of View, *ASME Journal of Tribology*, vol.135, no.4, 041103 (7 pages), 2013.
- [3] "Observation of Real Contact Area Using Laser Microscope with Wide Field of View", *Journal of Advanced Mechanical Design, Systems, and Manufacturing*, vol.5, no. 3, pp.150-159, 2011.
- [4] "Observation of Cylindrical Surfaces by Laser Microscopy with a Wide Field of View", *Journal of JSEM*, vol.10, Special Issue, pp.119-124, 2010.
- [5] "Experimental Study of the Performance of Static Seals Based on Measurements of Real Contact Area Using Thin Polycarbonate Films", *Trans ASME, J. Tribol.*, vol.132, Issue 2, 022202-1-7, 2010.
- [6] "Coupled Photon and Heat Transport Simulation inside Biological Tissue for Laser Therapy", *Journal of Thermal Science and Technology*, vol.4, no.2, pp.314-323, 2009.
- [7] "Frictional Properties of DLC films in Plane Contact due to Reciprocal Micro-Sliding", *Tribology Online*, vol.4, no. 3, pp.66-69, 2009.
- [8] "Relationship between Real Contact Area and Adhesion Force of Plasma-Treated Rubber Sheets Against Stainless-Steel Ball", *Tribology Online*, vol.3, no.7, pp.361-365, 2008.
- [9] "Effect of Interference on Scanning Performance of fθ Lens Fixed by a Shrink Fitter", *Optical Review*, vol.10, No.4, pp.321-324, 2003.
- [10] "Measurements of Distributions of Contact Pressures between Ground Surfaces Using PET Films", *JSME Int. Journal Series C*, vol.39, no.3, pp.621-627, 1996.
- [11] "The Development of a Vickers-type Hardness Tester for Cryogenic Temperatures down to 4.2K", *Cryogenics*, vol.36, no.2, pp.75-81, 1996.
- [12] "Shrink Fit between a Ceramic and a Metal Element Using a Hybrid Shrink Fitter (Measurements of Fitting Strengths)", *JSME Int. Journal Series C*, vol.38, no.3, pp.617-624, 1995.
- [13] "Measurements of Real Contact Areas using PET Films (Thickness, 0.9μm)", *Wear*, vol.181-183, pp.844-849, 1995.
- [14] "The Fitting Strength between Ceramic and Metal with the

Use of a Bimetal Shrink Fitter at Elevated Temperature", *JSME Int. Journal Series C*, vol.34, no.2, pp.249-256, 1991.

- [15] "The Effects of Work-hardening on the Contact Pressure and the Deflection of Asperity Points in Contact", *Wear*, vol.146, pp.325-335, 1991.

- [16] "Study of the Fitting Strength between Ceramic and Metal Elements with the Use of a Shrink Fitter at Elevated Temperature (Proposal of the Shrink-Fit Method with the Use of a Shrink Fitter and Experimental Results)", *JSME Int. Journal Series C*, vol.32, no.4, pp.632-639, 1989.

- [17] "The Effect of Surface Roughness on Fitting Strength of Shrink Fit between Ceramic and Metal Elements", *Trans ASME, J.Vib. Acoust Stress Reliab. Des.*, vol.111, pp.318-325, 1989.

Books

- [1] Nitta, I. 2007. *Contact Mechanics VIII*, WIT PRESS, pp.101-110.
- [2] Nitta, I. 2005. *Contact Mechanics VII*, WIT PRESS, pp.321-330.
- [3] Nitta, I. 2003. *Contact Mechanics VI*, WIT PRESS, pp.25-33.
- [4] Nitta, I. 2001. *Contact Mechanics V*, WIT PRESS, pp.31-40.
- [5] Nitta, I. 1999. *Contact Mechanics IV*, WIT PRESS, pp.49-58.