

Principal Researcher	Kazuhiro Hane			Number of Researchers	3	
Research Institution · Department · Title	Professor, Graduate School of Engineering, Tohoku University			Location of Institution	Sendai	
Title of Project	Tunable photonic devices fabricated by micro-nano machining for optical communication					
Abstract of Research Project	<p>The purpose of this project is to study optical communication devices with tunable functions using micromachining technology. Optical switch, attenuator, Bragg grating filter and photonic crystal filter are the examples. Lately, it has been desired earnestly to develop the miniaturized and highly functional optical components, since the numbers of Internet and cellular phone users have increased explosively. Especially, in the wavelength division multiplex technology, more than 100 channels will be multiplexed. Therefore, compact components for the wavelength selection, add/drop and attenuation are needed. On the other hand, after the development of optical fiber amplifier, all-optical systems including optical switches and optical equalizer etc. attract attentions. Especially, it is important to develop tunable devices for the wavelength selection. Although several techniques are proposed for the development of compact tunable optical components, micro-electro-mechanical systems (MEMS) attract a high level of interest because of the low-cross-talk and micro tunable mechanism.</p> <p>On the other hand, three-dimensional periodic sub-wavelength structures such as photonic crystal, sub-wavelength grating are reported to be very useful for the precise selection of wavelength, anti-reflection, refractive index control etc.. Assuming that the MEMS are combined with the photonic structures, it is expected to give several novel tunable functions to the photonic devices. In this project, combining MEMS with photonic structures (i.e. three-dimensional periodic sub-wavelength structures), new optical communication devices such as optical filter and optical switches will be fabricated.</p>					
References	<ol style="list-style-type: none"> 1."Broadband antireflection gratings fabricated on silicon substrate"Opt. Lett.24(1999) 1422-1424, Y. Kanamori, M. Sasaki, K. Hane 2."Broadband antireflection gratings for glass substrates fabricated by fast atom beam etching", Jpn.J.Appl.Phys.Part2 39,(2000)L735-L737.Y.Kanamori, H. Kikuta and K.Hane 3."100nm period silicon antireflection structures fabricated using a porous alumina membrane mask" Appl.Phys.Lett. 78 (2001)142-143, Y. Kanamori and K. Hane, H. Sai and H. Yugami. 4."Basic Studies of Fiber-Optical MEMS for Telecommunication Using Three Dimensional Micromachining", IEICE Trans. Electron. E84-C(2001)1785-1791.K.Hane, M. Sasaki ,J.-H. Song, Y. Taguchi, K. Miura, 5."Tunable Fiber Bragg grating combined with microactuator", Jpn.J.Appl. Phys. Part.1, 41(2002)4356-4361, M. Sasaki, K. Miura, K. Hane, K. Minami. 					
Term of Project	Fiscal years 2002-2006. (5 years)					
Budget Allocation	FY2002	FY2003	FY2004	FY2005	FY2006	Total
(in thousand of yen)	18,500	18,300	16,600	15,800	13,300	82,500
Homepage Address	http://www.hane.mech.tohoku.ac.jp					