集束イオンビーム励起表面反応プロセスを利用した光検出光ナノメカニカル素子の作製

Optomechanical device fabrication for the light detection using focused-ion-beam processing

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Nanofabrication using focused-ion-beam enables us to achieve the various functional nanodevices[1]. Various photonic devices such as plasmonic devices and optomechanical devices had been also researched using FIB nanoprocessing[2], [3]. In this study, an optomechanical device was fabricated for the wavelength detection of the light. The optomechanical device has a plasmonic structure as a wavelength filter and a thin film mechanical resonator for detecting the changes in resonance induced by irradiation of the light with a specific wavelength. In this experiment, we tried to detection of the light with the wavelength of 1,520-1,570 nm. Therefore, a spiral bull' eye antenna with the pitch of 1,450-1,650 nm was used as a plasmonic structure. And, a thin film resonator with Au/diamond-like carbon resonator (DLC) bi-layer structure was placed on the center of bull' eye antenna. The wavelength of irradiated light is measured by confirming the light irradiation position where a resonance frequency is changed. Figure 1 shows the a scanning electron microscope (SEM) image of an optomechanical nanodevice fabricated by focused-ion-beam chemical vapor deposition, XeF_2 gas etching and DC sputtering. In this fabrication, FIB-CVD was used in order to fabricate the thin film mechanical resonator and the spiral bull's eye periodic structure. 30 kV Ga FIB with a beam current of approximately 70 pA was used. And, phenanthrene ($C_{14}H_{10}$) was used for DLC deposition. Thus, FIB-CVD enables us to fabricate the device by a simple process. Then, wavelength detection properties were evaluated using a laser with a wavelength of 1550 nm.

Fabrication of the optomechanical resonator using FIB-CVD and the detection characteristics of the light will be reported in detail.

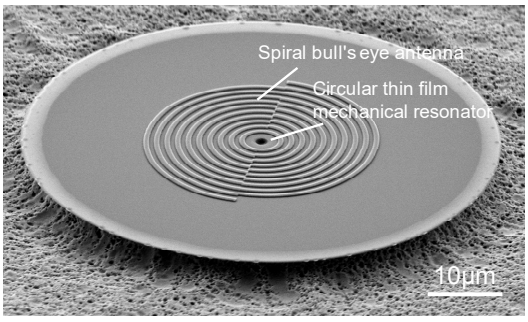

Fig. 1 SEM image of an optomechanical nanodevice fabricated by nanofabrication

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