

Electron-beam excited optical microscope with high resolution

W. Inami^{1,3}, K. Nakajima², A. Miyakawa^{2,3} and Y. Kawata^{2,3}

¹Division of Global Research Leaders, Shizuoka University
3-5-1, Johoku, Naka, Hamamatsu 432-8561, Japan

²Faculty of Mechanical Engineering, Shizuoka University,
3-5-1, Johoku, Naka, Hamamatsu 432-8561, Japan

³CREST, Japan Science and Technology Agency, Japan
E-mail: dwinami@ipc.shizuoka.ac.jp

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We propose an electron-beam excited advanced (EXA) optical microscope which has a few tens nanometer spatial resolution laterally and is possible to observe dynamic behaviors of specimens in various surroundings such as air or liquids. A nano-light source can be realized by focused electron beam instead of metal-coated fiber probe in conventional near-field microscope. The EXA-microscope has a potential to observe dynamic activities of living biological specimens with video frame rate, because an electron beam can be scanned with modulation of magnetic or electric field without any mechanical moving parts. The EXA-microscope enables to observe optical constants such as absorption, refractive index, polarization properties, and its dynamic behaviors in nanometer scale.

Figure 1(a) and 1(b) show schematic diagrams of the EXA-microscope and a magnified image of focal point in (a). As shown in Fig. 1(a), the EXA-microscope is composed of two parts. The scanning electron microscope (SEM) is for excitation and scanning of nano-light source. The optical microscope is used to collect scattered and transmitted light and detect the light intensity by PMT. In Fig. 1(b), a nano-light source in a few nanometers size is excited in an emission layer by focused electron beam that passed a vacuum seal. An electron beam can be focused to a spot size as small as 1 nanometer in diameter. Observation images are built by raster scanning of the electron beam.

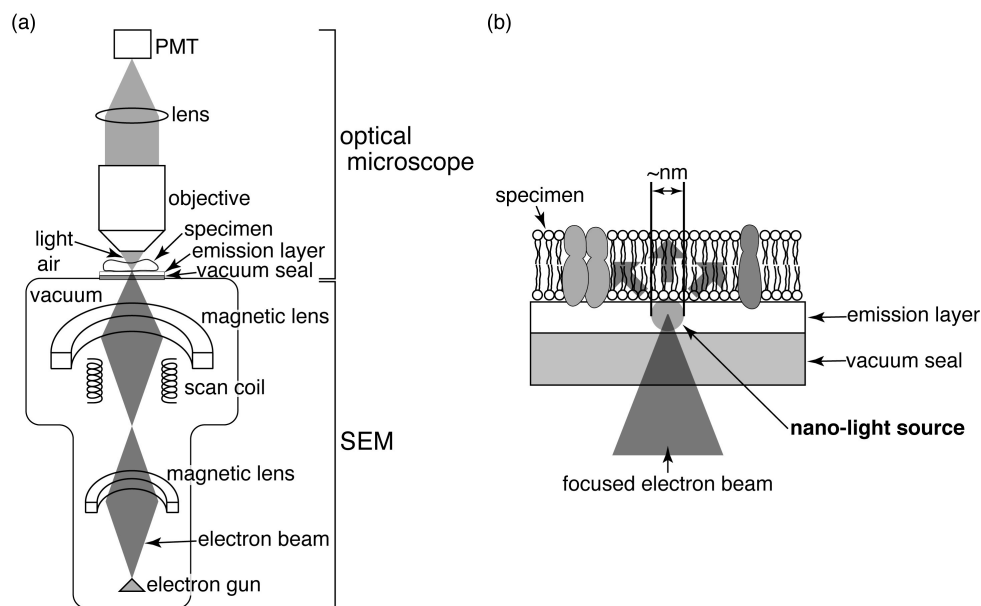


Fig.1: (a) Schematic diagram of the EXA-microscope.

(b) Magnified image of focal point in (a).

[1] W. Inami, K. Nakajima, A. Miyakawa and Y. Kawata (submitted.).