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Development of optical devices with Subwavelength Structure

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We have been developing the fabrication of mono-material optical interference filter toward high-sensitivity terahertz-wave astronomical observation.

There is no hi-transmittance optical filter for IR(Infrared-Rays) with wavelength in the range of 30~60μm due to lack of optical materials. But, silicon is hi-transmittance material in the range of that. Furthermore, using MEMS(Micro Electro Mechanical Systems) technology and SOI(Silicon-On-Insulator) wafer, we can fabricate 3D structure including SWS(SubWavelength Structure) with sufficient accuracy for IR filters. Fabricating interference filters made by only silicon using MEMS technology, we get hi-transmittance optical filter (~80%). SWS has the effective index of refraction which determined by the porosity. We can control the porosity by the SWS design. The technology of controlling effective index is useful for anti-reflection coating. Fabricating the appropriate SWS layer at the detector's surface, we realize anti-reflection easily.

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