Type II Superlattice Infrared Detector P15409-901

Compound Opto-semiconductor that Can Detect up to 14.5 µm
World's First Mass Production without Using Substances Restricted by the RoHS Directive

Hamamatsu Photonics is actively engaged in environmental conservation activities and in the pursuit of environmentally friendly manufacturing. We have contributed to the preservation of the global environment, the reduction of environmental burden and have been developing products with the impact on the environment always in mind. As a compound opto-semiconductor device capable of detecting up to 14.5 µm, the world's first "Type II superlattice infrared detector," was successfully mass produced without using substances restricted by the RoHS Directive*1, is one such product that reflects our efforts.

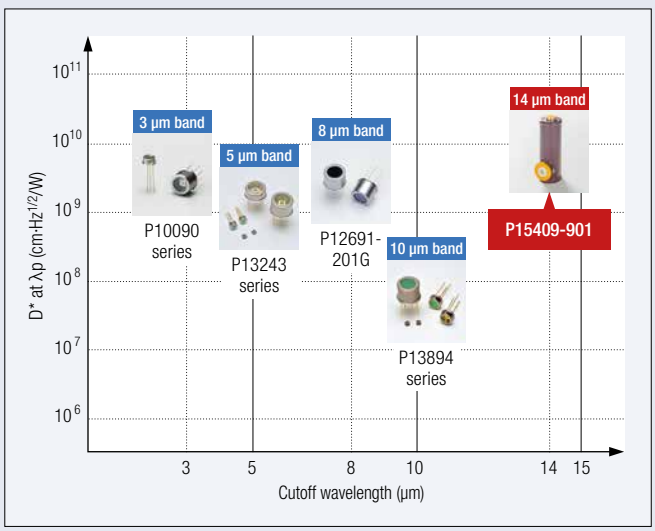
Mid infrared spectrophotometers that are required to comply with RoHS Directives

Spectrophotometry is an analysis method in which substances contained in liquids and gases are identified by using the property that the ratio of light emission and absorption varies depending on the bonding state of molecules and atoms.

The Fourier transform infrared spectrophotometer (FTIR) is used in a wide variety of fields such as food, agriculture, and medical care because it covers a wide range of absorption bands of organic substances existing near 14 µm.

However, many mid infrared detectors used in FTIR have elements containing mercury and cadmium, which are regulated by an EU RoHS Directive, so there was a need to develop an alternative product. Therefore, we have been developing infrared detectors that can detect up to the 14 µm band, which was not possible with conventional InAsSb*2 photovoltaic detectors.

Hamamatsu infrared detector lineup



Mass production of Type II superlattice infrared detectors

Until now, Hamamatsu has developed and sold InAsSb photovoltaic detectors that can detect up to 11 µm.

In the past, Type II superlattice infrared detectors have been considered as a way of detecting mid infrared light with a wavelength longer than 11 µm, but there was a problem in mass production because it required high manufacturing technology. So, we solved the manufacturing problems by using the crystal growth technology of compound opto-semiconductor devices cultivated over many years and achieved the world's first mass production of Type II superlattice infrared detectors.

Spectral response

More analytical instruments without restricted substances

Infrared wavelengths are not only used in FTIR but also in a wide range of other applications, such as gas component analysis and object temperature measurement. Such analytical instruments and measuring instruments may also use detectors containing substances restricted by the RoHS Directive. Replacing those detectors with this product will eliminate the use of restricted substances and achieve higher accuracy.

*1 The RoHS Directive is an EU ban on the use of certain hazardous substances in electrical and electronic equipment. It prohibits the sale of electrical and electronic equipment that contains more than a specified concentration of the restricted substances in the EU market.
*2 InAsSb: In (indium), As (arsenic), Sb (antimony)
*3 GaSb: Ga (gallium), Sb (antimony)
*4 MCT (HgCdTe): Hg (mercury), Cd (cadmium), Te (tellurium)

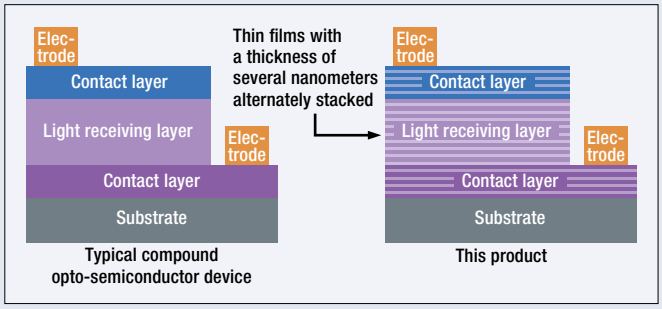
Main features

Hamamatsu's unique manufacturing technology made mass production possible

Unlike typical opto-semiconductors, the main feature of this product is the "superlattice" structure in which thin films of InAs and GaSb*3 compounds, each with a thickness of several nanometers, are alternately stacked to more than 2000 layers.

Mass production was achieved by precisely controlling the amount and timing of stacking InAs and GaSb to the substrate using Hamamatsu's unique compound semiconductor technology and optimizing temperature, pressure, and other conditions to establish a manufacturing method.

Structure differences



Excellent output linearity

Another main feature of this product is the output linearity up to a higher incident light level compared to the MCT*4 and other conventional detectors. The wide dynamic range can be expected to increase the precision of analyzers.

Linearity