Synopsis of Original Research Paper

Characterization of UVB-UVC sensitive nanomaterials

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In this research, we have established the microscopic system capable to measure the UVB to UVC white light extinction spectra. The colors in UV lights can be visualized through the spectroscopic techniques. As an example of the UV sensitive materials, alminum nanostructures, which has been considered as a new candidate of plasmonics, were evaluated by our microscopic system. This microscope provide us with a versatile knowledge for UV functionalized nanomaterials.

Recently, the field of "plasmonics" have been the focus of intense interest as a new method to design UV functionalized nanomaterials. In plasmonics light couples with metal free electrons in nanometric structures, exhibiting a localization and enhancement effect. One of the fascination applications of plasmonics in UV is to help to enhance the photocatalyst which is used for sterilization in organic solar cells. Another example is to increase the sensitivity of spectroscopic signal in UV region especially in protein or DNA detection which is essential for bioscience. The plasmonic nanoparticles can also be used for cosmetics e.g. sunglasses or sunscreens. The optical-electric properties of plasmonic nanostructures and nanoparticles are often evaluated by white light extinction spectroscopy under dark field microscope. The nanoparticles can be seen in variety of colors due to the different electric properties caused by the shape effect. However, in spite of the strong needs, the microscopic evaluation of these small structures are limited in visible region because the standard microscope is applicable only to the wavelength longer than 350 nm.

We have developed the spectroscopic measurement for quantitative measurements and analysis of the refractive index from UVB to UVC region to assign colors in this wavelength range. The system has been designed for better understanding of the relationship between the local structures and the optical properties through the microscopic technique. In this research, we will present the analysis of plasmonic nanoparticles made of aluminum by our microscopic system, which can work best in the wavelength range from 250 to 350 nm. Our newly established microscopic methods holds promise for the investigation of plasmonic nanoparticles and will contribute to develop the new type of UV-sensitive materials for semiconductor industry, biosciences, as well as cosmetics.