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**Application of helium plasma irradiated tungsten material as a new photocatalyst** TOMOKO YOSHIDA, EcoTopia Science Institute, Nagoya University, REO ETOH, HISAO YOSHIDA, SHIN KAJITA, NORIYASU OHNO, Graduate School of Engineering, Nagoya University — Recent works have shown that helium ions at the incident energy below the threshold value of physical sputtering produce nanostructures on the surface of bulk W. In the present work, we tried to use the nanostructured tungsten as a new type photocatalyst. After the helium plasma irradiation with the fluence of $2\times10^{21}/\mathrm{cm}^2$, a huge number of nanostructured rods with the average thickness of ca. 150-200 nm were observed by the SEM measurement. XPS and diffuse reflectance UV-vis analyses showed that the surface of the sample was oxidized from W(0) to $WO_3$ during the retention of the sample in air. Such nanostructured tungsten oxide was fundamentally maintained after the heat-treatment at 573 K for 30 min in air, although the average thickness of the nanostructured rods grew to ca. 200-300 nm. These nanostructured tungsten oxides exhibited photocatalytic activity under visible light irradiation. The photocatalytic decomposition of methylene blue proceeded over these samples whereas it was negligible over the commercial $WO_3$ powder sample. It has been suggested that the photocatalytic activity depends not only on the surface area but also on the size and/or chemical state of nanostructured tungsten oxide.

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