Reversible Photocurrent Switching in Ionic and Superionic Conductors of Polycrystalline Silver Iodide

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Abstract:

Photocurrent switching effect plays vital roles in a number of optoelectronic devices especially for the construction of various logic gates. In the conventional photocurrent switching materials, electrons and holes are the charge carriers. Here we propose that the ionic and superionic photocurrent in some polymorphs of silver iodide is also switchable. We observed that the polarity of photocurrent in the polycrystalline γ-AgI is positive when an area near the negative electrode is irradiated with visible light and photocurrent switched to negative values while area near the positive electrode is photoirradiated. Polycrystalline α-AgI derived from γ-AgI also shows the photocurrent switching effect, depending on the photoirradiation position. Such a complete polarity switching phenomenon was not obtained in polycrystalline β-AgI as well as the α-AgI derived from β-AgI. Usually, the polarity of the photocurrent is changed by reversing photoelectrode potential or by using light of different wavelengths or intensities. This study introduces a rather simple way to control the photocurrent switching by changing the position of irradiation of light of constant wavelength and intensity.

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