Fabrication of solar cells with tio2 nanoparticles sensitized using natural dye extracted from mangosteen pericarps

Nofrijon Sofyan, author

Abstrak

Faced with ever-shrinking reserves of fossil-based energy, in addition to the damaging impacts of the use of fossil-based energy sources, such as the greenhouse effect and global warming, efforts are needed to find energy alternatives. Currently under development as an alternative source of renewable energy, utilizing solar energy as its source, is a device incorporating the dye-sensitized solar cell (DSSC), which works using the simple photosynthetic-electrochemical principle at the molecular level. In this type of device, inorganic oxide semiconductors such as titanium dioxide (TiO2) offer great potential for the absorption of photon energy from the solar energy source, especially in the form of a TiO2 nanoparticle structure. In this study, a commercial TiO2 nanoparticle was used. The as-received TiO2 nanoparticle was characterized using X-ray diffraction (XRD) and a scanning electron microscope (SEM). For sensitizer, a natural dye extracted from mangosteen (Garcinia mangostana L.) pericarps was used. The extracted natural dye was characterized using Fourier transform infrared (FTIR) for the functional groups, whereas ultraviolet-visible (UV-Vis) was used to examine the absorption activity of the extracted natural dye. Performance of the DSSC was analyzed through a precision current versus potential difference (I-V) curve analyzer. The maximum power conversion efficiency (PCE) of the mangosteen natural dye was obtained using ethanol containing 20% distilled water as compared to commercial organic dye with a PCE of 4.02%. This result is convincing and promising for the next development.