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Biopolymer templated hierarchical titania films for hybrid solar cells

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Hybrid solar cells combine the advantages of inorganic and organic materials. This means long term stability and high charge carrier mobility, as well as flexibility and fabrication on a large industrial scale, respectively. However, the film morphology has crucial influence on the device performance, since a high surface-to-volume ratio is needed for efficient charge separation. So far, inorganic mesoporous matrices are successfully achieved by sol-gel chemistry in combination with block copolymer directed templating. As a novel approach, we use environmentally friendly biopolymers as tailoring agents. The whey protein ß-lactoglobulin was found to form different structures within denaturation, from fibrils to spheres. By combining heat denaturation at different acidic conditions and sol-gel chemistry, various nanosized structures are introduced into titanium dioxide. The resulting sol-gels are used as inks for film deposition via spray coating. In order to investigate the structural properties of these films, grazing incidence small-angle X-ray scattering (GISAXS) is performed. GISAXS measurements are supplemented by scanning electron microscopy.

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