

Ternary semitransparent organic solar cells with a laminated top electrode

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Semitransparent organic solar cells are receiving interest for applications in greenhouses, as chargers of portable electronics, or in building-integrated photovoltaics. Here, we demonstrate a ternary organic photovoltaic cell with a dry-laminated top electrode that achieves a uniform average visible transmittance of 51% and a power conversion efficiency of 3%. Our results show that organic ternary blends are attractive for the fabrication of semitransparent solar cells in general, because a guest component with complementary near-infrared absorption can compensate the inevitably reduced current generation capability of a high-performing visibly absorbing binary blend when applied as a thin, semitransparent film.



Roland Hany

Suppressing the coffee-ring effect of colloidal droplets by dispersed cellulose nanofibers

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A coffee ring is what you can see in your daily life when observing a dried droplet of coffee or tea. This phenomenon is of great importance in the drawing of pigment ink, in printed electronics and surface coating or in film fabrication from colloidal dispersion, which is important both for industry and scientific research. This article provides a new technique of preventing the coffee ring phenomena by the addition of a small amount of cellulose nanofibers (CNFs) into the dispersion. The drying of fluid component leads to a higher concentration of the CNFs, and the "rush hour" of particle transport to the droplet periphery at the final stage of drying is successfully suppressed. This is a conceptually new and environmentally friendly approach that operates between the molecular and macroscopic scales.



Itsuo Hanasaki

Mechanism of secondary recrystallization of Goss grains in grain-oriented electrical steel

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Grain-oriented (GO) electrical steel is mainly used as a core material for transformers contributing to energy saving in electrical power industry. It exhibits a grain size of over several millimeters with $\{110\}\langle 001\rangle$ (Goss) orientation attained by secondary recrystallization during high-temperature final batch annealing. In this review article, conceivable mechanisms of why the Goss orientation is exclusively selected during secondary recrystallization are described mainly based on the selective growth model.



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MDTS: automatic complex materials design using Monte Carlo tree search

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Complex materials design is often represented as a black-box combinatorial optimization problem. In this paper, we presented a novel python library called MDTS (Materials Design using Tree Search). Our algorithm employs a Monte Carlo tree search approach, which has shown exceptional performance in computer Go game. In comparison to a Bayesian optimization package, our algorithm showed competitive search efficiency and superior scalability. We succeeded in designing large silicon-germanium (Si-Ge) alloy structures that Bayesian optimization could not handle due to excessive computational cost.



Koji Tsuda