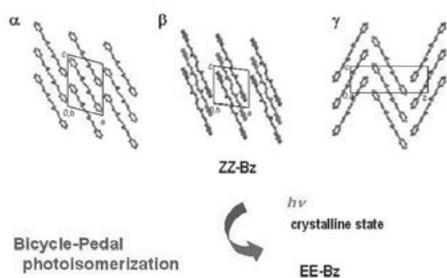


Organic reactions performed in the solid state have many intrinsic features for synthetic and materials chemistry because of the extremely high selectivity of the reactions. A limited number of the *E-Z* isomerizations of olefins in the crystalline state have been reported because of the difficulty in the inevitable change in the size and shape of the space occupied by the substituents of a double bond. Presently, we have revealed a change in the molecule structure of muconic esters, by the direct observation of single crystal structures during photoisomerization in the solid state. Benzyl (*Z,Z*)-muconate (*ZZ*-Bz) afford three polymorphs. During the solid-state photoisomerization of these polymorphs to the corresponding (*E,E*)-muconate (*EE*-Bz), it was revealed that the isomerization occurs via a topochemical reaction process according to a bicycle-pedal model and is finally accompanied by a phase transition to a stable crystal structure. After photoirradiation of powdered *ZZ*-Bz, the conversion to *EE*-Bz depended on the structure of the polymorphs. A difference in the reactivity is discussed on the basis of the molecular structures and the void space in polymorphic crystals.



Keywords: cis-trans isomerization, polymorphs, single crystals

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#### Defects in single crystalline Ge-doped silicon revealed by annealing under high hydrostatic pressure

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Germanium - doped Czochralski grown silicon (Cz-Si:Ge) with cGe exceeding 1 at.% has been rediscovered because Ge introduces controlled strain into layered structures, with carrier mobility competitive to the case of III-V semiconductors. Annealing of Cz-Si:Ge with low Ge content under enhanced hydrostatic pressure (HP) at high temperature (HT) results in specific structural transformations, of interest for integrated circuits technology. Defects in Cz-Si:Ge, with cGe =  $1.4 \times 10^{-3}$  and 1.4-7.6 at.%, containing also oxygen in a concentration up to  $1 \times 10^{18} \text{ cm}^{-3}$ , and processed at up to 1400 K under HP up to 1.2 GPa were investigated by synchrotron topography, high resolution X-ray diffractometry, Infrared Spectroscopy, photoluminescence (PL) and related methods. Topography of Cz-Si:Ge reveals uniform structure in the case of cGe =  $1.4 \times 10^{-3}$  at.% while Ge segregation is detected for Cz-Si:Ge with cGe exceeding 1.4 at.%. The presence of dislocations at  $10(3) \text{ cm}^{-2}$  density has been stated after processing. X-Ray diffuse scattering is most pronounced for the samples with cGe = 2.6 at.%; its intensity decreases with HT (HP). Annealing at 1270 K for 5 h resulted in the increased lattice parameter (a), e.g. for Cz-Si:Ge with cGe = 1.4

at.%, a = 0.5440574 nm, 0.5441908 nm if annealed under 10(5) Pa but 0.5441113 nm after processing under 1.1 GPa. The PL intensity at 1.07 eV, related to the presence of electron-hole droplets, decreased after processing, evidencing out-annealing of point-like defects under HP. The effect of HT - HP on Cz-Si:Ge is related, among others factors, to stress-induced activation of Ge clusters promoting precipitation of interstitial oxygen. On the other hand, the treatment under HP results in the improved overall homogeneity of Cz-Si:Ge.

Keywords: microstructure, Si-Ge, annealing

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#### Structure of synthesized nano-sized perovskite oxide $\text{La}_{1-x}\text{Ce}_x\text{CoO}_3$

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Nanosized  $\text{La}_{1-x}\text{Ce}_x\text{CoO}_3$  ( $x < 0.1$ ) cobaltide oxide powder with perovskite structure was synthesized at different calcination temperatures using the amorphous heteronuclear complex  $\text{La}_{1-x}\text{Ce}_x\text{Co}(\text{DTPA})_6\text{H}_2\text{O}$  ( $x = 0.1$ ) as precursor. The effects of the calcination temperature was examined by XRD, TEM and BET methods. The crystal structure of perovskite type  $\text{La}_{1-x}\text{Ce}_x\text{CoO}_3$  ( $x < 0.1$ ) was refined by X-ray Rietveld analysis for three different calcination temperatures, and its correlation with catalytic activities is discussed. The results indicated that the  $\text{La}_{1-x}\text{Ce}_x\text{CoO}_3$  ( $x < 0.1$ ) cobaltide oxide powder is not of pure perovskite type and with increasing calcination temperature from  $T = 600 \text{ }^\circ\text{C}$  to  $T = 900 \text{ }^\circ\text{C}$  the grain size of  $\text{La}_{1-x}\text{Ce}_x\text{CoO}_3$  ( $x < 0.1$ ) increases. The specific surface area varies from 4.347 to  $9.016 \text{ m}^2/\text{g}$ . The results reveal that the calcination temperature plays a key role in controlling the morphology, crystallization and phase compositions of  $\text{La}_{1-x}\text{Ce}_x\text{CoO}_3$  ( $x < 0.1$ ) perovskite type oxide. After being calcined at  $T = 800 \text{ }^\circ\text{C}$  for 3 h, the  $\text{La}_{1-x}\text{Ce}_x\text{CoO}_3$  ( $x < 0.1$ ) catalyst exhibits the highest catalytic activity for carbon monoxide oxidation.

Keywords: perovskite oxide, X-ray powder diffraction, catalytic combustion

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#### New insights into the Mo-Sn bond in binuclear complexes

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