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X-RAY TOPOGRAPHIC INVESTIGATIONS OF LARGE OXYGEN PRECIPITATES IN SILICON

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Oxygen precipitates in samples of Czochralski grown silicon crystal annealed at various temperatures from 750 to 1100° C were studied with X-ray methods realized both with white and monochromatic synchrotron radiation The samples were additionally controlled by means of infrared Fourier spectroscopy; laser scattering tomography and observation of selective etching pattern. Interesting and original results reported here were obtained with Bragg-case section topography using the beam limited by 5 μm slit at glancing angles 5 and 10°. In general the significant effect was observed with all methods after relatively long annealing times (2.5 hours at 1100°). With X-ray methods at the first stage it consisted in small irregularities of Pendellösung fringes in transmission section topography. It was interesting that in back reflection geometry the section topographs usually revealed fringes characteristic for bent crystals; which can also be produced by strain gradients generated by oxygen precipitates. For longer annealing times the individual precipitates were resolved in the section topographs. The concentration of precipitates is strongly increasing along some striations while in other parts of the crystal the interference fringes were present For sample annealed 6 hours at temperature increasing from 600 to 1050° C and further 6 hours at 1050° C. the interference fringes vanished and the oxygen precipitates can be resolved only in some areas. Also in this case the concentration of precipitates corresponds to the striations.
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COLLAGEN-APATITE COMPLEXES IN VERY DENSE BONES

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Most vertebrate boney tissues are composed mainly of mineralized collagen fibrils containing parallel arrays of platey crystals of carbonate apatite. This mineral commonly comprises about two-thirds by weight of the bone. However, several tissues with specialised functions have very much higher mineral contents. Recently, we have determined the structure of one of these, the rostrum of the toothed whale M. densirostris. It consists of parallel rods, composed of stacked strips of highly crystalline carbonate apatite, and enclosed in tubules of thin collagen fibrils. No structure like this had been described before, but now we have found two more examples in the bulla bones of the inner ears of a dolphin and a whale. This structural motif may be more widely distributed. Recent studies have indicated stacks of platey apatite crystals in peritubular dentin. This too is hypermineralized, with little collagen, but is contiguous to the intertubular dentin, which is composed of mineralized collagen fibrils. However, dense brittle bones from patients with Osteogenesis Imperfecta have a paucity of normal collagen, leading to overmineralized regions with structurally unorganized crystals deposited onto fibril surfaces or in separate clusters.

Keywords: **BONE COLLAGEN BIOMINERALIZATION**

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LOCALISATION OF RELEASE FACTOR 3 ON THE RIBOSOME BY CRYO-ELECTRON MICROSCOPY

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The process of protein synthesis contains 3 major parts: initiation, elongation and termination. Termination requires two types of protein release factors (RFs). The bacterial RF1/RF2 are involved in stop codon recognition and peptide hydrolysis, whereas the GTPase RF3 induces release of RF1 or RF2 from the ribosome. We have determined the *E.coli* ribosome complex containing RF3 with a non-hydrolysable GTP analog using cryo-electron microscopy and three-dimensional reconstruction of single particles. Fitting of the crystal structure of the 70S-ribosome from *T.thermophilus* allows the localization of RF3. Its position suggests an interaction with the RF2 that was previously localized; interaction areas with RF2 and the ribosome including the α-sarcin-ricin loop are revealed.

Keywords: **RELEASE FACTOR RIBOSOME CRYO-ELECTRON MICROSCOPY**

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DETECTION OF THE ARSENIC-DOPED REGION IN SILICON BY CONVERGENT-BEAM ELECTRON DIFFRACTION

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A characterization method of local structures and physical properties of identified small specimen areas is a key technique for developing highly integrated semiconductor devices. We have investigated a method to detect an arsenic-doped region in a silicon wafer by conventional transmission electron microscopy (TEM), energy-filtered electron microscopy and convergent-beam electron diffraction (CBED). Arsenic atoms were planted in silicon wafer with a density of 10^{14}-10^{15} atoms/cm^2. The maximum implantation depth was about 100 nm. Thus, the average density of arsenic atom is 10^{19}-10^{20} atoms/cm^3. The wafer was annealed to recover the disorder introduced by the implantation process and prepared for TEM observations by using a focused ion-beam instrument.
From a conventional TEM observation, there was no defect in the arsenic-doped region. From a result of secondary ion mass spectrometry analysis, arsenic atoms exist in the region. Selected-area electron-diffraction patterns of the region showed that the region has a perfect periodicity. Thus, arsenic atoms would occupy the diamond lattice sites of silicon. Energy-filtered images obtained by using valence-loss electrons did not show any characteristic contrast for the doped region. A characteristic contrast for the arsenic-doped region was observed in dark-field electron microscope images. The contrast was assigned to be due to a fluctuation of lattice plane and/or a change of structure factor, because an arsenic atom (Z = 33) has a larger atomic radii and larger atomic scattering amplitude than those of a silicon atom (Z = 14). A characteristic intensity distribution was also observed in CBED patterns obtained from the doped region.

Keywords: **CBED, As-DOPING, SEMICONDUCTOR**