

Random selections

Preparation of artificial metalloenzyme by insertion of chromium(III) Schiff base complexes into apomyoglobin mutants

M. Ohashi *et al.*

Angew. Chem. Int. Ed. Engl., 2003, **42**, 1005–1008

Metalloenzymes carry out chemical transformations with high specificity. The authors describe a new strategy for insertion of metal–complex catalysts into a semi-synthetic apomyoglobin reconstituted with Cr(III) Schiff base complexes into the active site by binding to His-93. The artificial metalloenzyme retains low activity.

Effect of magnesium ions on oriented growth of calcite on carboxylic acid functionalized self-assembled monolayer

Y. J. Han and J. Aizenberg

J. Am. Chem. Soc., 2003, **125**, 4032–4033

MgNO₃ is added as an additive in the crystallization of calcite (CaCO₃) using carboxylic acid functionalized self-assembled monolayers as templates. Mg²⁺ ions produce a noticeable effect on the crystal size and shape distribution. Use of growth modifiers along with the template of a chemically modified surface appears a promising chemical route to controlled growth of crystals.

Solution structure and stability of tryptophan-containing nucleopeptide duplexes

I. Gomez Pinto *et al.*

ChemBioChem., 2003, **4**, 40–49

A phospho-diester bond between the hydroxy group of a homoserine side chain and the 3' end of the oligonucleotide has been created to generate a covalently linked peptide–oligonucleotide hybrid useful for studying tryptophan–DNA interactions. The structure and stability of several hybrids have been studied by both NMR and CD spectroscopy and by restrained molecular dynamics methods. The oligonucleotide structure is a well-defined duplex that belongs to the B-form family of DNA structures. The covalently linked peptide adopts a folded structure, in which the tryptophan side chain stacks against the 3'-terminal guanine moiety, which forms a cap at the end of the duplex. The stacking interaction is not observed in the single-stranded form of the nucleotide, indicating that the

duplex DNA contributes to the stability of the nucleopeptide duplex. Another interesting feature of this nucleopeptide structure is that tryptophan approaches the G–C base pair on the major groove side to the duplex. Similar stacking interactions are known in complexes of viral nucleopeptide proteins, and between an HIV-1 nucleocapsid proteins and an RNA loop.

Modifying the stereochemistry of an enzyme-catalysed reaction by directed evolution

G. J. Williams *et al.*

Proc. Natl. Acad. Sci. USA, 2003, **100**, 3143–3148

Molecular biologists are improving the properties of biocatalysts, especially for asymmetric and stereo-selective synthesis, by 'directed evolution'. Procedures involving DNA shuffling and screening can alter stability, activity and specificity of enzymes that are not available from natural sources. The authors report an 80-fold increase in k_{cat}/K_m and 100-fold change in stereospecificity of enzyme aldolase for a non-natural substrate fructose 1,6-bisphosphate. P31 NMR spectroscopy shows the catalytic formation of unnatural diastereoisomers. The procedure will be of use in making carbohydrate mimetics.

Wavelength-tunable semiconductor pump diode for reconfigurable Raman amplification

P. Steinvurzel *et al.*

Appl. Opt., 2003, **42**, 1692–1698

Raman amplifiers are becoming important in optical communication systems. In conventional Ge-doped fibre, peak Raman gain occurs around 13 THz down shifted from each pump wavelength. The authors report a semiconductor diode that works as a tunable pump for Raman amplification. The diode can be tuned over more than 20 nm. The effects of wavelength tuning on the Raman gain are investigated.

A novel method for preparing copper nanorods and nanowires

Z. Liu and Y. Bando

Adv. Mater., 2003, 303–305

Copper nanorods and nanowires may become as common in the nanodevices as they presently are in the electric and elec-

tronic circuits. They are chiefly made by reduction of copper compounds and electrochemical deposition. The authors report a new method for preparing copper nanorods and nanowires by heating a copper grid vaporization and redeposition under vacuum conditions. The novel approach is cheap, easy and high in yield.

Noise in eukaryotic gene expression

W. J. Blake *et al.*

Nature, 2003, **422**, 633–637

Aspects of individual phenotypic variations and cellular differentiation can be explained in terms of noise during the process of transcription of eukaryotic genes. The experimental measurements demonstrate that stochastic noise is significant during initiation of transcription, leading to heterogeneity in the pulses of messages that can be modulated at the translational level.

Structural and kinetic analysis of catalysis by a thiamin diphosphate-dependent enzyme, benzoylformate decarboxylase

E. S. Polovnikova *et al.*

Biochemistry, 2003, **42**, 1820–1830

Biochemical and molecular genetic analysis of a thiamin diphosphate-dependent enzyme, benzoylformate decarboxylase, shows that the catalysis is strongly affected in the three active site mutants S26A, H70A and H281A. Kinetic analysis suggests that the hydroxyl moiety of S26 is important for substrate binding and the residue H70 plays a catalytic role. Studies with substrate analogues reveal that H70 assists in decarboxylation and H281 is required for protonation of the enamine.

The receptor binding protein P2 of PRD1, a virus targeting antibiotic-resistant bacteria, has a novel fold suggesting multiple functions

Lan Xu *et al.*

Structure, 2003, **11**, 309–322

Bacteriophage PRD1 contains protein P2 that binds to receptors on *E. coli*. This protein resembles the corresponding functional counterpart in adeno-virus fibre. The P2 structure is solved from two different crystal forms and shows a novel fold of its head with pseudo-6-fold symmetry. Another novel fold is described in its long tail.