

**Extracellular synthesis of gold nanoparticles by the fungus *Fusarium oxysporum***

Priyabrata Mukherjee, Satyajyoti Senapati, Deendayal Mandal, Absar Ahmad, M. Islam Khan, Rajiv Kumar and Murali Sastry

*Chem. Bio. Chem.*, 2002, **3**, 461–463.

This group from the National Chemical Laboratory (Pune, India) claims the first finding of extracellular synthesis of 8–40 nm sized gold nanoparticles by a eukaryotic system such as fungus *Fusarium oxysporum*. Gold nano-particles were formed simply by soaking the biomass for a period up to 72 h in a conical flask containing  $\text{AuCl}_4^-$  ions and the reduction of the metal ion could be monitored at 545 nm using UV/visible spectroscopy. Thin films of the particulate product were characterized by TEM and FTIR spectroscopy. Further fractionation of the extracellular culture filtrate from the fungal biomass confirmed the presence of at least four protein factors in the molecular size ranges of 66 kDa to 10 kDa, containing the putative reductase activity. *In vitro* reconstitution experiments established the requirement of stoichiometric amounts of NADH in the function of the reductase.

**Factors involved in the formation of amorphous and crystalline calcium carbonate: A study of an Ascidian skeleton**

Joanna Aizenburg, Gretchen Lambert, Steve Weiner and Lia Addadi

*J. Am. Chem. Soc.*, 2002, **124**, 32–39.

Macromolecules are often found in biogenic minerals, like amorphous calcium carbonate, that are key components regulating the features of growth and texture. Amorphous calcium carbonate (ACC) is rapidly transformed *in vitro* into a stable crystalline polymorph, calcite. The authors describe a detailed study of biogenic calcium carbonate in the tunic spicules formed by the ascidian *Pyura pachydermatima*. They show that the proteins associated with ACC core are rich in glutamic and hydroxy-amino acids, whereas the crystalline layers of calcium carbonate are rich in aspartic acid residues. It is suggested that metal ions and macromolecules co-operate in the stabilization of ACC *in vivo*.

**Time-resolved reflection surface X-ray diffraction**

Hawoong Hong, Z. Wu, T. C. Chiang, P. Zschack and Hayden Chen

*Rev. Sci. Instrum.*, 2002, **73**, 1720–1723.

The time-resolved reflection surface X-ray diffraction techniques were developed utilizing high brilliance X-rays from a dedicated surface/interface diffractometer in a undulator beamline of a third generation synchrotron (advanced photon source). A highly sensitive charge coupled device (CCD) detector was fixed in one position and X-rays with an energy of 25 keV were used for generating two-dimensional time-resolved X-ray diffraction patterns from surfaces and interfaces in a reflection geometry. This configuration can achieve a time resolution of one second. The authors demonstrate the use of these techniques to study dynamical processes during growth and phase transitions of Ag and Pb films on Si surfaces.

**Design and synthesis of fluorescent reporter of protein kinase activity**

Chien-An-Chen, Ren Hwa Yeh and David S. Lawrence

*J. Am. Chem. Soc.*, 2002, **124**, 3840–3841.

Protein kinases are ubiquitous in signaling systems involving second messengers. Such kinases phosphorylate serine, threonine or tyrosine residues, and rarely aspartate residues, on the cognate protein substrates. Attachment of a fluorescent reporter probe at or near the site of phosphorylation would be handy in deciphering the stereochemistry and mechanism of phosphorylation of the substrate. The authors describe the design rationale and synthesis of a new family of peptide substrates for protein kinase C (PKC) incorporating a fluorescent probe. Phosphorylation of these peptides could be directly monitored by observing the changes in fluorescence.

**Template-directed self-assembly of 10- $\mu\text{m}$ -sized hexagonal plates**

Thomas D. Clark, Rosaria Ferri, Joe Tien, Kateri E. Paul and George M. Whitesides

*J. Am. Chem. Soc.*, 2002, **124**, 5419–5426.

Mesoscale self assembly (MESA) could be used to form crystalline arrays with objects of 10–30  $\mu\text{m}$  in the longest dim-

ensions. These techniques might find use in fabrication of self-assembling micro-electronic systems and of structures at nanoscale. This work reports a template-directed synthesis of self-assembled and ordered molecular microstructures.

The self-assembling components were 4  $\mu\text{m}$ -thick hexagonal metal plates. 1000 templates and 100-fold excess of plates were mixed in a glass cuvette and the templated arrays were generated based on capillary interactions. Hexagonal plates (4  $\mu\text{m}$  thick plates having sites 10  $\mu\text{m}$  in length) and templates (4  $\mu\text{m}$ -thick circular metal plates with a central cavity) were fabricated using photolithography and electrodeposition.

**Linguistic ability and early language exposure**

Rachel I. Mayberry, Elizabeth Lock and Hena Kazmi

*Nature*, 2002, **417**, 38.

Age is considered crucial in the success of learning a new language. The ability to learn a language, spoken or signed, declines with age. This study compared the learning of deaf and normal hearing individuals to discover any correlation between early brain development and early exposure to a new language. Results show a synergy between early brain development and language experience, and conclude that the timing of the initial language exposure is crucial during the development of human linguistic ability.

**Effects of size and temperature on developmental time**

James F. Gillooly, Eric L. Charnov, Geoffrey B. West, Van M. Savage and James H. Brown.

*Nature*, 2002, **417**, 70–73.

A model was constructed to predict the time of ontogenic development as a function of bodymass (size) and temperature. Laboratory data on the embryonic development were obtained by incubating eggs of four different groups of aquatic ectotherms at different constant temperature. Post-embryonic development times and adult body masses were obtained from a compilation of published data available in the literature. The model is based on the first principles of allometry and biochemical kinetics and is useful in defining a general definition of biological time common to all organisms studied.