

s5.m19.o1 **Are the HOH Layers of the Heterophyllosilicates Suitable to Prepare Pillared Materials?** Giovanni Ferraris, Dipartimento di Scienze Mineralogiche e Petrologiche, Università di Torino, and Istituto di Geoscienze e Georisorse, CNR, Via Valperga Caluso 35, 10125 Torino, Italy. E-mail: giovanni.ferraris@unito.it

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By analogy with phyllosilicates, a group of titanosilicates whose structures are based on *TOT*-like layers has been named heterophyllosilicates [1]. In these modular [2] compounds, a row of Ti-polyhedra periodically substitutes a row of disilicate tetrahedra in the *T* tetrahedral sheet that is typical of the layer silicates. *HOH* layers are thus obtained, where *H* stands for hetero to indicate the presence of the rows of five- or six-coordinated Ti in a sheet corresponding to the *T* sheet of the layer silicates. The heterophyllosilicates form a polysomatic series with general formula $I_{2+2n}Y_{4+3n}[Ti_2(O)_{2+2p}Si_{4+4n}O_{14+10n}](O'')_{2+2n}$. In the formula, atoms belonging, even in part, to the *H* sheet are shown in square brackets. *I* are large (alkali) interlayer cations and *Y* are octahedral cations; *O'* (bonded to *Ti*) and *O''* (belonging to the octahedral sheet only) can be oxygen, OH, F or H₂O; the 14+10*n* oxygens are bonded to Si. The value of *p* depends on the coordination of Ti. Depending on the periodicity of the Ti substitution, three types of *HOH* layers are known so far. (i) – Bafertsite-like (*HOH*)_B layer: in the H sheet a bafertsite-like module $B = I_2Y_4[Ti_2(O)_4Si_4O_{14}](O,OH)_2$ is one-to-one intercalated with a one-chain-wide mica-like module $M = IY_3[Si_4O_{10}](O,OH)_2$. About 30 rare minerals occurring in hyperalkaline rocks are structurally based on a (*HOH*)_B layer. These minerals show a large variety of interlayer contents [3]. (ii) – Astrophyllite-like (*HOH*)_A layer: relative to the (*HOH*)_B layer, a second one-chain-wide mica-like module *M* is present between two *B* modules. Some species are known, but they differ only in chemistry and not in structure. (iii) – Nafertsite-like (*HOH*)_N layer: relative to the (*HOH*)_B layer, a second and a third one-chain-wide mica-like module *M* are present between two *B* modules. Only the mineral nafertsite belongs to this group [1]. As mentioned above, the (*HOH*)_B layer occurs in different crystal structures, even if the corresponding minerals are rare, and transformations involving only the substitution of the interlayer content are known. All heterophyllosilicates show a very easy cleavage parallel to the *HOH* layer and in some case the bonding between layers is very loose, because it may depend only from hydrogen bonds (e.g., in shkatulkalite) and minor alkaline atoms (e.g. murmanite and epistolite). Thus, the *HOH* layer shows a behaviour that is very similar to that exploited for the synthesis of mesoporous pillared materials for which clay minerals are used as source of the *TOT* layer [4]. In order to test the possibility of preparing pillared materials based on *HOH* layers, a programme for their synthesis has been started.

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s5.m19.o2 **Mesoporous Materials as Nucleation-Inducing Substrates for Protein Crystallization.** Naomi E. Chayen^a, Emmanuel Saridakis^a Yael Nemirovsky^b and Larry Hench^c ^aBiological Structure and Function Section, Division of Biomedical Sciences, Faculty of Medicine, Imperial College London SW7 2AZ, UK, ^bDepartment of Electrical Engineering, The Technion, Haifa, Israel ^cDepartment of Material Science, Imperial College London SW7 2AZ, UK. E-mail: n.chayen@imperial.ac.uk

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Protein crystals play a pivotal part in Structural Genomics, hence there is an urgent requirement for new and improved methodology to aid crystal growth. Considerable effort has been invested in the search of substances (nucleants) that will induce efficient heterogeneous nucleation of protein crystals in a controlled manner [e.g. 1-3]. To date, nucleation has been facilitated mainly by seeding, epitaxy, charged surfaces or mechanical means. A different approach is introduced here, involving the use of mesoporous materials that are likely to constrain protein molecules and thereby encourage them to aggregate in crystalline order. Crystals were obtained using such materials at conditions that are not sufficient for spontaneous nucleation [4], for 7 out of 8 proteins that were investigated. We believe that this success is due to the size distribution of pores in the specially designed porous material.

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