Making Matter—The Atomic Structure of Materials

Whenever solid-state chemists try to teach students the special features of crystalline structures, they again and again run into the same problems. Media like books, transparencies, and the blackboard are limited to two dimensions and are therefore not suitable to clearly illustrate three-dimensional arrangements of atoms—even for the most skilled illustrator. The web site inconspicuously named "Making matter—the atomic structure of materials" (Figure 1) by M. Hewat will take away the fear of entering the jungle of sometimes complex structural relations from teachers and students alike.

The site consists of three parts: After a short introduction, questions such as "Why is understanding crystal structures important?" or "In which way do equally sized atoms arrange?" are answered in an impressive and vivid manner in the main part. A small final chapter draws the attention of the reader towards the possibility to download all the pictures in different formats.

An unfortunate mixture of more or less useful information makes the introduction a bit confusing. There is a short report about the history of this web site, the database it is built on, and about who is (until now?) mainly using the database. Readers should, however, concentrate their attention on the following, well done main part. Remarkably, a Russian translation of the site (by Prof. Pavel. E. Kolosov, University of Omsk) is available.

The highlight of this web site is the main part. Here, readers will be informed about ten representative topics of structural chemistry of solids. Each link opens a page consisting of explanations and high-quality graphical representations of crystal structures. Subjects reach from the concept of close packing and the holes therein to phase transitions in ferroelectrics, such as the perovskite-type structure, the chemical bond, zeolites, crystal structures of minerals and gems, superconductors, magnetic materials, and finally lubricants and clays. With the free "cosmoplayer" plugin[1] installed, the representations in VRML format allow you to rotate these structures "in your hand" with the mouse to inspect it from different directions as required (Figure 2).

The contribution concerning the chemical bond fits least into the aim of this web site. The topic can only be addressed briefly with less informative pictures (diamond, graphite, fullerene). The further chapters delight the reader with very illustrative views of the crystal structures of quite different solids. One of the delicacies is the representation of a three-dimensional spin structure in the chapter on magnetic materials. Another highlight is offered in the ferroelectrics section: Animated representations make the switching processes in perovskites like $BaTiO_3$ vivid. In the chapter on lubricants and clays the attention of the user will be drawn to the relationship between crystal structure and macroscopic properties. Last but not least the interested reader will find a lot of very illustrative pictures on the crystal structures of important minerals through a link. Everybody who is hooked here may want to follow another link with more detailed information concerning gemstones, such as their occurrence and processing. The same is true for the contribution about zeolites with a link to the well known "Atlas of zeolite structures".

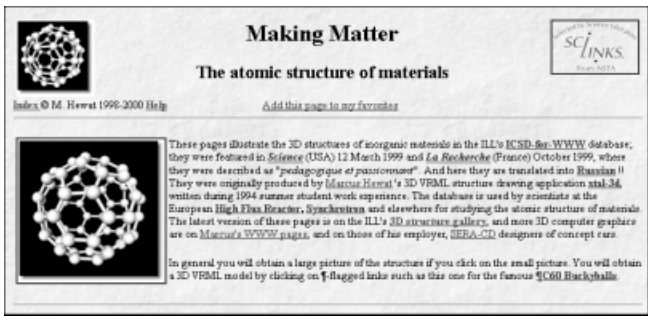

Figure 1. Entry page of "Making Matter".

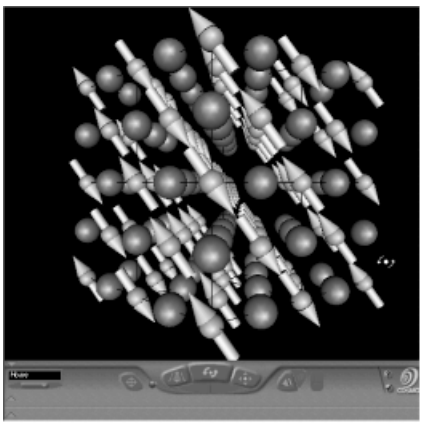

Figure 2. Three-dimensional crystal structures, such as antiferromagnetic MnO, can be rotated through the Cosmoplayer plugin.

Unfortunately, this web site loses some of its professional appearance due to a somewhat confusing introductory chapter, which, however, should not keep you away from the very high quality of the main part. Whoever looks for a fast and very illustrative survey of important aspects in the structural chemistry of solids should see the "making matter" web site.

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[1] http://www.cai.com/cosmo/

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