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OREDATA--A PC Database of Optical Properties of the Opaque Minerals

by

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Open-File Report
89-566A Program Documentation (paper copy)
89-566B Source Code, Executable Program, dBASE Data File, and Documentation (comments included in data, 1.2 MB 5-1/4" floppy disk)
89-566C Source Code, dBASE Data File, and Documentation (comments not included in data, 360 KB 5-1/4" floppy disk)
89-566D Executable Program (comments not included in data, 360 KB 5-1/4" floppy disk)

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INTRODUCTION

OREDATA is a database of optical properties of opaque minerals designed to quickly extract a list of minerals whose characteristics match those observed in an unknown specimen. The data file of 286 minerals includes information on chemical composition, crystallographic system, color, tint, bireflectance, anisotropy, reflectance, Vickers hardness, internal reflections, polishing hardness, and general comments.

Whelan (1988) originally compiled the data file using Filemaker Plus on a Macintosh computer. The primary data source was "Tables for Microscopic Identification of Ore Minerals" by Uytenbogaardt and Burke (1971), and the compilation contains about half of the minerals listed by those authors. Supplemental data were taken from Picot and Johan (1982) and Criddle and Stanley (1986); "(P&J)" and "(QDF2)" are used to denote citations from these references. We edited the data file transferred from Macintosh computer to IBM PC to correct errors that occurred during data transmission between computers. In addition, B.F. Leonard provided additional suggestions to improve the data file.

OREDATA runs on an IBM PC or PC-compatible computer. The program is written in dBASE III PLUS command language and can be run from within dBASE. An executable version of the program, compiled using Quicksilver, version 1.2C, can be run without the use of dBASE.

PROGRAM AND DATA DISKS

This report includes two versions of the database, one with comments and one without. Because the data file with comments does not fit on a low-density 5-1/4-inch floppy disk, you must be able to read the file from a high-density 5-1/4-inch disk if you want comments.

Three release disks are available:

Disk 1) This 5-1/4-inch 1.2 Mb floppy disk includes the entire database. COREDATA.DBF is the complete dBASE data file, including the comments section; this file is too large to fit on the standard 360 Kb disk. COREDATA.EXE is the executable program to read and list all data, including comments. COREDATA.PRG, CMINERAL.PRG, and COPTICAL.PRG are dBASE source code that can be run from within dBASE. OREDATA.DOC is program documentation.

Disk 2) This 5-1/4-inch 360 Kb floppy disk contains a shortened version of the database. OREDATA.DBF is the dBASE data file, without the comments section. OREDATA.PRG, MINERAL.PRG, and OPTICAL.PRG are dBASE source code that can be run from within dBASE. OREDATA.DOC is program documentation.

Disk 3) This 5-1/4-inch 360 Kb floppy disk contains OREDATA.EXE, the executable program to go with the short dBASE file on Disk 2.

DATABASE STRUCTURE

Information for each mineral in the database is contained in an individual record. Each record in the complete OREDATA data file has fifteen data fields, including two long fields for comments. The short version of the database does not contain comments. Database field names are MINERAL, FORMULA, CRYSTAL, COLOR, TINT, COLOR_OIL, TINT_OIL, BIREFLECT, ANISOTROPY, REFLECT, VICKERS, INTERNAL_R, P_HARDNESS, COMMENTS_1, and COMMENTS_2. A typical database record, as displayed by the program, is shown on Figure 1.

All the data fields in this database are character fields. If you want to search for a particular string in a data field, remember that the search will find any field that contains that sequence of characters. For example, if you search for the mineral name tin, you will get any record that contains the string "tin" in the MINERAL field, such as "betekhtinite" and "platinum". But you will not find the mineral tin because it is not in the database. If you search for the number 10, you will get any record that contains the string "10" in that field, such as "100", "101", etc.

MINERAL and FORMULA. These two fields contain the name of the mineral whose properties are listed in the record and the chemical composition of the mineral, as given by Uytenbogaardt and Burke (1971).

CRYSTAL. This field indicates the crystallographic system to which the mineral belongs. The listing may be one of the following: cubic, hexagonal, hexagonal-rhombohedral, tetragonal, ortho (orthorhombic), mono (monoclinic), triclinic, pseudohexagonal, pseudocubic, or pseudotetragonal.

COLOR. This is the color of the mineral as given by Uytenbogaardt and Burke (1971). Possible colors are white, gray, blue, red, yellow, brown, green, orange, violet, black, cream, and pink. More than one color is often listed in this field, such as red listed with pink or orange. Uytenbogaardt and Burke (1971) also report the color of most minerals in comparison to commonly associated minerals, but this information was not included in the data file.

TINT. The "tint" field notes faint color deviations from the dominant color of the mineral. Search possibilities are the same as for color. "Blu" will find both blue and bluish.

COLOR_OIL and TINT_OIL. These fields lists color and tint when they differ noticeably from color and tint of the mineral in air.

BIREFLECT. Degree of bireflectance is listed as nil, weak, distinct, strong, and v strong. Color variations shown by the mineral in different orientations are described. Because color descriptions are extremely subjective, this field is most easily searched for degree of bireflectance.

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211  Pyrite
     Fe.S2
CRYSTAL SYSTEM..cubic
COLOR.....yellow
COLOR (oil).....
TINT.....white cream
TINT (oil).....
BIREFLECTANCE...nil
ANISOTROPY.....isotropic, often weakly to distinctly
                anisotropic; blue-green to orange-red
REFLECTANCE.....54 hi
VHN.....913-2056
INTERNAL REFLECTIONS...
POLISHING HARDNESS.....>aspy, cobaltite; slt>marc, hem;
                <sperrylite, laurite, cassiterite
COMMENTS:  Generally idiomorphic, coarser grains showing rect or square
outlines; also coarse grained aggregates of xl fragments, coarse grained
sphere-like aggregates, fine grained idiomorphic, fine-grained skeletal, very
fine grained spherical (often with colloidal texture); cleavages // to (100),
(311), and (111) may be visible; twinning lamellae rare; zoning not uncommon;
higher Co, Ni, or Cu contents result in pinkish, reddish, or violet tints; may
also contain significant quantities of Au or As or Sb; p. 206; 791.

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Figure 1. Data record for pyrite, as displayed by Program OREDATA.

ANISOTROPY. Degree of anisotropy is listed as isotropic, weak, distinct, strong, and v strong. Colors shown by the mineral under crossed polars are described. This field is most easily searched for degree of anisotropy.

REFLECT. This field lists the percent reflectance in air at 540 nanomenters (nm), or as close to this wavelength as published values permit. The reflectance of anisotropic minerals varies with orientation, so reflectance is often given as a range of values. Because the database manager will not search for a range, this field also contains a text modifier. Reflectance is categorized as v low (0 to 10%), low (10 to 30%), mod (30 to 50%), hi (50 to 70%), and v hi (>70%); search this field using these modifiers.

VICKERS. This field contains Vickers hardness number, usually given as a range; for example 913-2056 for pyrite (fig. 1). Because the database manager cannot search for a range, this field cannot be easily searched.

INTERNAL_R. Any internal reflections that the mineral may display are listed here. This field is most conveniently searched by color.

P_HARDNESS. The polishing hardness of the mineral in comparison to those minerals with which it is frequently in contact is listed here. This field, because it usually contains so few comparative hardnesses, is not suitable for searching.

COMMENTS_1 and COMMENTS_2. Because 254 characters is the maximum character field length in dBASE, the "comments" have been broken into two fields. These fields list the typical form of the mineral, describe what, if any, twinning or cleavage may occur, and describe any other characteristic features of the mineral. "Comments" do not list the common associates of the mineral, nor its common position in the paragenetic sequence. That information can be found in either Uytenbogaardt and Burke (1971) (the first page number listed) or Ramdohr (1980) (the second page number listed).

USING THE DATABASE

OREDATA is accessible in two ways. If you have a copy of dBASE, you can use the data file and run the program from within the database manager. If you do not have dBASE, you can use the executable program to access the data file.

The database program starts with a main menu that gives you two options: 1) retrieve data by mineral name, or 2) retrieve data by optical properties. If you choose option 1, you can enter a complete mineral name or just part of a name to retrieve data. For example, "pyrite" will also retrieve "arsenopyrite" and data for other minerals whose names contain the character sequence "pyrite". Retrieved data will appear on the screen and will also be stored in "MINERAL.LST", a file you can print from the DOS prompt. If you want to print the file, be sure to do so before you run another search from option 1; otherwise, MINERAL.LST will be overwritten by the next search.

Option 2 brings up a second menu which allows you to input observations for your unknown mineral: color, bireflectance, anisotropy, reflectance, and internal reflections. Enter the appropriate information followed by a

carriage return. Note that on this menu you can move between boxes using the up and down arrow keys. Retrieved data will appear on the screen and will also be stored in "OPTICAL.LST", a file you can print from the DOS prompt. If you want to print the file, remember to do so before you run another search from option 2; otherwise, OPTICAL.LST will be overwritten by the next search.

The program will use the exact string of characters you enter to search the database. You can enter complete word(s) or just part of a word. Remember when you search on "Reflectance" to use the categories v low, low, mod, hi, and v hi (see REFLECT, p. 4). The search will not be case-dependent, so you can enter uppercase letters, lowercase letters, or a combination.

Please inform us of errors in the listings or of problems running the database. If you have a copy of dBASE, it will also be easy for you to modify or add to the database. If you make interesting observations of minerals listed here, add minerals to the database, or improve the database in any way, we would like to know. Perhaps you could update Joe Whelan annually. If there are a significant number of such additions and improvements, we are willing to serve as a clearinghouse for revisions of the database and the distributions of same.

dBASE PROGRAM

To use the database in dBASE, copy OREDATA.PRG, MINERAL.PRG, OPTICAL.PRG, and OREDATA.DBF from Disk 2 into the dBASE directory on your hard disk. If you have a high-density disk drive and want to use the database complete with comments, instead copy COREDATA.PRG, CMINERAL.PRG, COPTICAL.PRG, and COREDATA.DBF from Disk 1 into the dBASE directory on your hard disk. The "C" is at the beginning of each name to remind you that it is the "comments" version; be sure to rename the files OREDATA.PRG, MINERAL.PRG, OPTICAL.PRG, and OREDATA.DBF on the hard disk or they will not run properly.

To run the database program, enter "DBASE OREDATA". If you use <ESC> <ESC> <C> to exit the program, you will find yourself at the dBASE "." prompt. If you then want to run the database program again, enter "DO OREDATA". To exit to DOS, enter "QUIT". If you are an experienced dBASE user, you can use the database file, OREDATA.DBF, to search on any of the fields in the database. You can also modify the data file and add data for new minerals.

EXECUTABLE PROGRAM

If you do not have a copy of dBASE, copy OREDATA.DBF from Disk 2 and OREDATA.EXE from Disk 3 onto your computer's hard disk. If you have a high-density disk drive and want to use the database complete with comments, instead copy COREDATA.EXE and COREDATA.DBF from Disk 1 into the dBASE directory on your hard disk. The "C" is at the beginning of each name to remind you that it is the "comments" version; be sure to rename the files OREDATA.EXE and OREDATA.DBF on the hard disk or they will not run properly.

To run the database program, enter "OREDATA". Use <ESC> <ESC> <C> to exit the program during a search.

ABBREVIATIONS USED IN THE DATA FILE

~ - approximately equal to
aspy - arsenopyrite
bn - bornite
cc - chalcocite
cov - covellite
cpy - chalcopyrite
gn - galena
hem - hematite
hex - hexagonal
hi - high
ilm - ilmenite
IR - internal reflections
lo - low
lt - light
marc - marcasite
mod - moderate
moly - molybdenite
mono - monoclinic
mt - magnetite
ortho - orthorhombic
pent - pentlandite
pleo - pleochroism
po - pyrrhotite
py - pyrite
rect - rectangular
rhombo - rhombohedral (trigonal)
sl - sphalerite
slt - slightly
ten - tennantite
tet - tetrahedrite
v - very
w/ - with
xl - crystal
xlites - crystallites
xln - cryst alline

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B.F. Leonard of the U.S. Geological Survey encouraged us to transfer this database to the PC, reviewed the database, and provided countless suggestions to make it as useful as possible for ore mineral identification. We are indebted to Ben for his suggestions and enthusiastic support.

Thanks also to Larry Hanson, who transferred the data from Macintosh format to PC format, and to Susan Huffman, who used Quicksilver, version 1.2C, to compile executable versions of the dBASE programs.

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