

## GROWTH AND STATUS OF THE ARGONNE PREMIUM COAL SAMPLE PROGRAM

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### ABSTRACT:

The Argonne Premium Coal Sample Program (APCSP) was established to provide samples to the basic coal research scientific community. The quality of these samples is intended to be the best that can be devised and implemented. Samples of eight U. S. coals have been selected, collected, processed and packaged, analyzed and distributed. Information has been disseminated through Symposia, Quarterly Newsletters, and a Users Handbook. The number of publications is now about 1 for each two shipments of coal samples, and is approaching 200.

### INTRODUCTION:

There has been a need for a set of coal samples that can be compared and provide a basis for meaningful correlations, and that will also be stable over long periods of time. This set of samples must also be available over a long period of time to permit as extensive a set of studies to be done with this set of samples as the research community would need.

In response to the need and with the support of the U. S. Department of Energy, Office of Basic Energy Sciences, Chemical Sciences Division, the Argonne Premium Coal Sample Program (APCSP) was initiated. A set of eight U. S. coals was selected to represent a range of chemical parameters of importance (carbon, hydrogen, sulfur and oxygen content) as well as maceral concentrations, and paleobotanic origins. These coals were carefully collected with the help of personnel from the U. S. Geological Survey and the Pittsburgh Testing Laboratory.

The eight coals are indicated in Table I, below.

Table I. Argonne Premium Coal Samples and Some Characteristics

#	Seam	State	Rank	C	H	O	S	Ash
1	Upper Freeport	PA	Med. Vol. Bit.	86	4.7	8	2.3	13
2	Wyodak-Anderson	WY	Subbituminous	75	5.4	18	0.6	9
3	Illinois #6	IL	High Vol. Bit.	78	5.0	14	4.8	15
4	Pittsburgh (#8)	PA	High Vol. Bit.	83	5.3	9	2.2	9
5	Pocahontas #3	VA	Low Vol. Bit.	91	4.4	2	0.7	5
6	Blind Canyon	UT	High Vol. Bit.	81	5.8	12	0.6	5
7	Lewiston-Stockton	WV	High Vol. Bit.	83	5.3	10	0.7	20
8	Beulah-Zap	ND	Lignite	73	4.8	20	0.8	10

The coals are listed in the order collected. The weight % C, H and O values are given on the moisture and ash-free basis, while S and ash are on the dry basis.

The premium quality requires maximal effort to achieve each of several objectives with regard to the handling of the coal. These objectives included minimal oxygen exposure, humidity control, thorough mixing, extensive analysis and long term supplies. Minimal oxygen exposure involved the use of a freshly exposed coal face for the sample, and rapid removal of the sample. The samples were placed in stainless steel drums, sealed and purged with 99.999% argon at the mine site, typically starting within three hours of collection. The samples were sealed in the drums and slightly pressurized for transport to Argonne National Laboratory (ANL) for processing in a unique nitrogen-filled enclosure. This large glove box is about 5-6' wide, 13' tall and would be 40' long if it were built in a straight line. This glove box is operated with 100 ppm of oxygen or less during the processing to protect the samples from atmospheric oxygen. The samples are sealed in glass with this atmosphere. The humidity control is exercised to minimize any moisture loss during the processing. The lack of moisture loss is expected to avoid any damaging effect on the coal pores and retain the properties of the pristine coal as much as possible. The samples are thoroughly mixed in one ton batches in a mixer-blender to provide uniform properties throughout the entire batch. The samples have been extensively analyzed by the Commercial Testing and Engineering Company through a series of more than 50 different laboratories for the proximate and ultimate analyses. About 20% of the ton-sized batch was packaged into sealed glass ampoules containing either 5 grams of -100 mesh or 10 grams of -20 mesh material. This supply seems sufficient to meet current demand levels for about 30 years for the more popular samples and longer for those which are less frequently requested.

#### CURRENT STATUS AND USAGE

Requests for samples come at an irregular but frequent basis. The shipments to date exceed 12,000 ampoules to more than 256 users distributed over the world. The total number of ampoules which were shipped since January 1986 is shown in Figure 1. The most-requested samples can be seen from Figure 2, which shows the number of ampoules shipped for each of the samples in the order collected.

The inventory of ampoules is such that shipments can continue at the current rate for about 30 years. This would require the filling of additional ampoules to replenish the inventory from 5 gallon carboys which have been prepared for this purpose. The capacity exists to provide about 50,000 of the ampoules of 5 grams of -100 mesh material and 25,000 of the 10 grams of -20 mesh size.

#### USERS HANDBOOK

The Users Handbook for the Argonne Premium Coal Sample Program (1) has served as the primary document which provides information about the program. This Handbook was initially issued in March 1989 as a 37 page document. It contained a description of the program including the selection, collection, processing and packaging of the samples as well as the analysis and distribution methods. Later sections included analytical information and bib-

liography of references to the work published referring to the samples. Indices by author, subject and journal were included. Finally some safety and ordering information were included.

The popularity of the document and the increasing amount of available information led to the publication of the second edition in October 1989. The amount of analytical information was increased, the bibliography grew to 111 references, a coal index was added and a new literature summary was started. This document had grown to 64 pages. The material appeared also in the form of an Argonne National Laboratory report with the number ANL/PCSP-89/1 which is available through the National Technical Information Service as a referenceable document. Free copies may be obtained on request to the author.

The document is continually growing as the literature references increase in number. At the time of the writing of this paper, (May 1990) there were 178 references in the draft. The authors know of enough additional papers in various stages of review to realize that the number should surpass 200 near the time of presentation of this paper. The analytical information grows as it is reported in the literature and individual investigators supply it to the author. There are over 30 pages of it in the draft. A new paper describing the APCSP has been prepared and is intended to appear in the literature (2) as well as in the future version of the Handbook. This reference can be used by all future authors of papers on research with these samples to facilitate future literature searches, and aid in providing complete bibliographies. A number of papers have already appeared which describe the program and related activities (3,4,5,6,7).

The number of publications and shipments continues to increase. The current ratio of shipments to papers is about two shipments per paper.

#### QUARTERLY NEWSLETTER

In addition to the Users Handbook a Newsletter is mailed without charge to the recipients of the samples and some individuals who have asked to be on the mailing list. This Newsletter provides information of value to the users and aids in keeping them current on additions to the bibliography which appears in the Handbook.

#### SYMPOSIA

This paper will be part of a Symposium on Research with Argonne Premium Coal Samples. The Symposium is the fourth in an annual series which have been organized to provide a forum for current work with the samples. The combination of Symposia, Newsletters and Handbooks is intended to provide an efficient and effective means of dissemination of information about the samples.

#### FUTURE PLANS

The APCSP plans included the development of the capability to offer separated macerals to the coal research community. Limitations on funding brought about by the U. S. budget deficit and

restrictions on support by the Gramm-Rudman bill have led to a postponement of new projects for an indefinite period. This activity will wait until funding is available. It is hoped that separated maceral concentrates from the Lewiston-Stockton sample will be available as a liptinite concentrate, a vitrinite concentrate, and an inertinite concentrate. The large amount of vitrinite in the Illinois #6 sample will lead to an effort to offer not just the three concentrates but also three vitrinite concentrates as low, medium and high density vitrinite.

The Users Handbook will continue to grow as the number of references continues to grow. These will be incorporated in the bibliography. The literature summary cannot be continued as originally envisaged due to limitations on the support for the program and the expertise of the author. Instead efforts are underway to recruit a number of volunteers to participate in the review of the literature and contribute to the Literature Summary section. Recognition of the authors will be included, and the reviews will be reviewed by other individuals for balance and completeness. As the number of pages grows this document will approach the size of a preprint of the Fuel Chemistry Division. The cost of printing and distribution will probably limit publication to an annual basis.

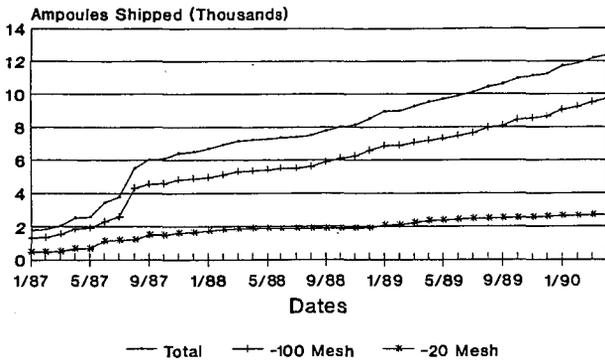
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**Fig. 1 Total Ampoule Shipments Through April 1990**



**Fig. 2 Number of Ampoules Shipped Through April, 1990**

