科技随笔

—郭慕孙科研手稿选集

下集

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我十九岁进大学上化学试验课时，老师要求我们每人要有一本笔记本，记录所有试验现象和数据以及个人的设想。从此我养成了“随想随记”的习惯。我三十六岁（1956 年）回国后，很欣赏我们国家提倡“一步一个脚印”的工作作风。于是，40 多年来，我积累了不少手稿。明年我即将资深，我没有什麼具有物质价值的东西留给后人，不如将这些手稿略加整理，汇集成本，供人参考。

我选了 67 篇原始手稿（约 500 页），未加改写，按时序排列。这些手稿始于文革后的“第二个科学春天”，直至今天。第一篇是在伊郎举行的国际化工会议的手写稿的初稿的第一页，最后一篇是我从事的业余爱好，“几何动艺”的最近设计。

整理汇集的工作从今天开始。

郭慕孙　　1999－7－16

控手稿档案索引编排

Individual Files 手稿 (I = individual files) 上集

11-1=10

	73 - 4 - 1	i Particulate Fluidization in Chemical Metallurgy	2 pp
	76 - 6 - 28	i #3A 流态化烘干机	1
	76 - 7 - 19	i 应城 15,000t/y 石膏炉：热料入炉	4
x	82 - 2 - 12	i Generalized Fluidization of Polydisperse Systems – Tentative Modeling of Particle Concentration Profile	9
	83 - 3 - 12	i 菱镁矿的煅烧	2
	86 - 6 - 5	i Iron Oxide Reducer with *in situ* CO Generation	4
	95 - 1 - 25	i 煤的拔头工艺	4
	97 - 2 - 26	i Peristaltic Feeder – Sequencing, Pressure Gradient and Venting Rate	4
	97 - 2 - 6	i Peristaltic Feeder – Hardware	2
	99 - 5 - 25	i How Dense Could CFB Get to ?	9
	99 - 1 - 23	i Straight Line Twister	2

硫酸纸 手稿 (t = tracing paper) 上集

25-1=24

	74 - 3 - 7	t 气控多层流态化床	12 pp
	75 - 7 - 15	t 铁矿粉载流还原反应器	9
	75 - 7 - 23	t 顺流串联反应器	14
	75 - 9 -	t 张庄铁矿氢还原反应器设计 2.反应系统选择	20
	75 - 9 - 21	t 双粒度广义流态化	20
	75 - 10 - 11	t 微分洗涤器的数学模拟	6
	76 - 3 - 8	t 快速流态化 一些实验数据的初步分析	14
	76 - 3 - 31	t 攀枝花太和铁精矿流态化氢还原反应器设计	18
	76 - 4 - 17	t 张庄铁矿氢还原反应器设计 3.沧州 100kg/d 炉试验数据处理	8
	76 - 4 - 21	t 万吨气体炼铁厂方案建议	3
	76 - 7 - 1	t 天然气流态化还原 40 矿：还原～造气～动力综合流程	10
	76 - 8 - 5	t 沧州气体炼铁，3000t/y 配套工程：H_2-N_2 自循环流程	4
x	76 - 8 - 21	t 三室：工作、学术交流和汇报	1
	76 - 10 - 1	t 快速流态化 2.一个数学模型	9
	76 - 10 - 14	t 顺流粉矿预热炉	12
	77 - 1 - 26	t 磁场料阀	4
	77 - 2 - 6	t 焙烧红土矿时镍铁还原度之间的关系	4
	77 - 2 - 7	t 流态化热载体炼铁	7
	77 - 2 - 13	t 浓相输送溢流管	22
	78 - 6 - 24	t 变压溢流管	7
	79 - 1 - 16	t 快速流态化 3.数学模型的试验验证	6
	79 - 8 - 3	t The Jigged Reducer	4
	80 - 2 - 14	t GENERALIZED FLUIDIZATION III. A Tentative Treatment of Nonideality for Gas-Solid Systems	21
	81 - 1 - 21	t MULTI-STAGED FLUIDIZED BEDS – L/S Fill-and-Dump Type	8
	81 - 11 - 13	t The Jigged Reducer II	8

Miscellaneous Ideas 手稿 (m=miscellaneous) 下集

x	57 - 1 - 10	m Physical Properties of Fluidizing Media	1 pp
	undated	m Writing Scientific English	5
	80 - 3 - 1	m 合纤厂流态化解吸	2
	80 - 11 - 17	m 用分步结晶法从包头炉渣中富集稀土金属	1
	81 - 1 - 13	m Cocurrent Multistage Fluidized Bed	10
x	undated	m Memo to Zhang Chuangen	1
	81 - 6 - 3	m 向科学院提出意见 6 条	8
	83 - 11 - 14	m From Concept to Technology	11
	85 - 10 - 13	m Moving-Bed Filter-Washer MBFW	2
	88 - 1 - 14	m Fluidized Hospital Bed	6
	88 - 2 - 3	m FBF Roaster G	7
	88 - 3 - 27	m Integral CFB Reactor	4
	88 - 4 - 6	m Integral CFB Reactor II	3
	88 - 6 - 27	m Peristaltic Solids Feeder	1
	88 - 6 - 29	m Coal-Gas-Mixture CGM	2
	88 - 7 - 19	m Response of LSFB to Step Changes	5
	88 - 11 - 28	m Regenerative Solid-Adsorbent Process for Desulfuring Flue Gas	2
	89 - 1 - 6	m Proposed Topics for Basic Study in Energy Science	1
	89 - 12 - 9	m Particulatized Gas Fluidization	8
	90 - 1 - 13	m CFB Pyrite Roaster	1
	90 - 8 - 3	m Integral CFB Reactor III	2
	90 - 10 - 30	m Proposed Designation for Fluid-Particle Heterogeneity	3
	91 - 10 - 11	m Tailoring Chemical Engineering Research to China's Needs	8
	93 - 10 - 10	m Rice Cleaner	3
	93 - 11 - 13	m Thermal-Carrier-Based Processes for Comprehensive Utilization of China"s Unique Resources	3

Ring Notebook 手稿 (r=ring notebook) 下集

	79 - 2 - 18	r 关于 501 厂煅烧 Al_2O_3 的一些意见	1 pp
	80 - 11 - 5	r 三级劣煤燃烧器	3
	80 - 11 - 30	r 磁化焙烧：快速床 + 间接还热	7
	82 - 5 - 1	r A Pneumatic Solids Extractor	4
	82 - 10 - 16	r High-Temperature Granular-Bed Filter	6
	82 - 10 - 30	r Distributor Design for the Cocurrent Multistage Shallow Fluidized Beds	5
	82 - 11 - 4	r Experiments on the L/S Magnetized Fluid Bed	5
	82 - 11 - 26	r Impact-Stabilized Fluid-Bed Distributor	3
	82 - 12 - 13	r Reactor Analysis for Fast Fluidization – a tentative formulation of the problem	7
	83 - 3 - 8	r The Jigged Reducer III	5

科技随想 手稿 （时序）

(i=individual; t = tracing paper; m=miscellaneous; r=ring notebook)

	73 - 4 - 1	i Particulate Fluidization in Chemical Metallurgy	2 pp
	undated	m Writing Scientific English	5
	74 - 3 - 7	t 气控多层流态化床	12 pp
	75 - 7 - 15	t 铁矿粉载流还原反应器	9
	75 - 7 - 23	t 顺流串联反应器	14
	75 - 9 -	t 张庄铁矿氢还原反应器设计 2.反应系统选择	20
	75 - 9 - 21	t 双粒度广义流态化	20
	75 - 10 - 11	t 微分洗涤器的数学模拟	6
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10	76 - 3 - 31	t 攀枝花太和铁精矿流态化氢还原反应器设计	18
	76 - 4 - 17	t 张庄铁矿氢还原反应器设计 3.沧州 100kg/d 炉试验数据处理	8
	76 - 4 - 21	t 万吨气体炼铁厂方案建议	3
	76 - 6 - 28	i #3A 流态化烘干机	1
	76 - 7 - 1	t 天然气流态化还原 40 矿：还原～造气～动力综合流程	10
	76 - 7 - 19	i 应城 15,000t/y 石膏炉：热料入炉	4
	76 - 8 - 5	t 沧州气体炼铁：3000t/y 配套工程：H_2-N_2 自循环流程	4
	76 - 10 - 1	t 快速流态化 2.一个数学模型	9
	76 - 10 - 14	t 顺流粉矿预热炉	12
	77 - 1 - 26	t 磁场料阀	4
20	77 - 2 - 6	t 焙烧红土矿时镍铁还原度之间的关系	4
	77 - 2 - 7	t 流态化热载体炼铁	7
	77 - 2 - 13	t 浓相输送溢流管	22
	78 - 6 - 24	t 变压溢流管	7
	79 - 1 - 16	t 快速流态化 3.数学模型的试验验证	6
	79 - 2 - 18	r 关于 501 厂煅烧 Al_2O_3 的一些意见	1 pp
	79 - 8 - 3	t The Jigged Reducer	4
	80 - 2 - 14	t GENERALIZED FLUIDIZATION III. A Tentative Treatment of Nonideality for Gas-Solid Systems	21
	80 - 3 - 1	m 合纤厂流态化解吸	2
	80 - 11 - 5	r 三级劣煤燃烧器	3
30	80 - 11 - 17	m 用分步结晶法从包头炉渣中富集稀土金属	1
	80 - 11 - 30	r 磁化焙烧：快速床 + 间接还热	7
	81 - 1 - 13	m Cocurrent Multistage Fluidized Bed	10
	81 - 1 - 21	t MULTI-STAGED FLUIDIZED BEDS – L/S Fill-and-Dump Type	8
	81 - 6 - 3	m 向科学院提出意见 6 条	8
	81 - 11 - 13	t The Jigged Reducer II	8
	82 - 5 - 1	r A Pneumatic Solids Extractor	4
	82 - 10 - 16	r High-Temperature Granular-Bed Filter	6
	82 - 10 - 30	r Distributor Design for the Cocurrent Multistage Shallow Fluidized Beds	5
	82 - 11 - 4	r Experiments on the L/S Magnetized Fluid Bed	5
40	82 - 11 - 26	r Impact-Stabilized Fluid-Bed Distributor	3
	82 - 12 - 13	r Reactor Analysis for Fast Fluidization – a tentative formulation of the problem	7
	83 - 3 - 8	r The Jigged Reducer III	5
	83 - 3 - 12	i 菱镁矿的煅烧	2
	83 - 11 - 14	m From Concept to Technology	11
	85 - 10 - 13	m Moving-Bed Filter-Washer MBFW	2

	86 - 6 - 5	i Iron Oxide Reducer with *in situ* CO Generation	4
	88 - 1 - 14	m Fluidized Hospital Bed	6
	88 - 2 - 3	m FBF Roaster G	7
	88 - 3 - 27	m Integral CFB Reactor	4
50	88 - 4 - 6	m Integral CFB Reactor II	3
	88 - 6 - 27	m Peristaltic Solids Feeder	1
	88 - 6 - 29	m Coal-Gas-Mixture CGM	2
	88 - 7 - 19	m Response of LSFB to Step Changes	5
	88 - 11 - 28	m Regenerative Solid-Adsorbent Process for Desulfuring Flue Gas	2
	89 - 1 - 6	m Proposed Topics for Basic Study in Energy Science	1
	89 - 12 - 9	m Particulatized Gas Fluidization	8
	90 - 1 - 13	m CFB Pyrite Roaster	1
	90 - 8 - 3	m Integral CFB Reactor III	2
	90 - 10 - 30	m Proposed Designation for Fluid-Particle Heterogeneity	3
60	91 - 10 - 11	m Tailoring Chemical Engineering Research to China's Needs	8
	93 - 10 - 10	m Rice Cleaner	3
	93 - 11 - 13	m Thermal-Carrier-Based Processes for Comprehensive Utilization of China"s Unique Resources	3
	95 - 1 - 25	i 煤的拔头工艺	4
	97 - 2 - 26	i Peristaltic Feeder – Sequencing, Pressure Gradient and Venting Rate	4
	97 - 2 - 6	i Peristaltic Feeder – Hardware	2
	99 - 5 - 25	i How Dense Could CFB Get to ?	9
69	99 - 1 - 23	i Straight Line Twister	2

科技随想 手稿分类

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概言

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	99 - 1 - 23	Straight Line Twister	2

工艺

	75 - 9 -	t 张庄铁矿氢还原反应器设计 2.反应系统选择	20
	76 - 4 - 21	t 万吨气体炼铁厂方案建议	3
	76 - 7 - 1	t 天然气流态化还原 40 矿：还原 ~ 造气 ~ 动力综合流程	10
	76 - 7 - 19	i 应城 15,000t/y 石膏炉：热料入炉	4
	76 - 8 - 5	t 沧州气体炼铁：3000t/y 配套工程：$H_2 - N_2$ 自循环流程	4
	77 - 2 - 7	t 流态化热载体炼铁	7
	79 - 2 - 18	r 关于 501 厂煅烧 Al_2O_3 的一些意见	1
	80 - 3 - 1	m 合纤厂流态化解吸	2
	80 - 11 - 17	m 用分步结晶法从包头炉渣中富集稀土金属	1
	80 - 11 - 30	r 磁化焙烧：快速床 + 间接还热	7
	83 - 3 - 12	菱镁矿的煅烧	2
	86 - 6 - 5	I Iron Oxide Reducer with *in situ* CO Generation	3
	88 - 6 - 29	m Coal-Gas-Mixture CGM	2
	88 - 11 - 28	m Regenerative Solid-Adsorbent Process for Desulfuring Flue Gas	2
	93 - 11 - 13	m Thermal-Carrier-Based Processes for Comprehensive Utilization of China"s Unique Resources	3
	95 - 1 - 25	煤的拔头工艺	4

设备

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	81 - 11 - 13	t The Jigged Reducer II	8
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	88 – 6 – 27	m Peristaltic Solids Feeder	1
	90 – 1 – 13	m CFB Pyrite Roaster	1
	90 – 8 – 3	m Integral CFB Reactor III	2
	93 – 10 – 10	m Rice Cleaner	3
	97 – 2 – 26	Peristaltic Feeder – Sequencing, Pressure Gradient and Venting Rate	4
	97 – 2 – 6	Peristaltic Feeder – Hardware	2

14

基础

	75 – 9 – 21	t 双粒度广义流态化	20
	75 – 10 – 11	t 微分洗涤器的数学模拟	6
	76 – 3 – 8	t 快速流态化 一些实验数据的初步分析	14
	76 – 10 – 1	t 快速流态化 2.一个数学模型	9
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	90 – 10 – 30	m Proposed Designation for Fluid-Particle Heterogeneity	3
	99 – 5 – 25	How Dense Could CFB Get to ?	9

14

67

WRITING SCIENTIFIC PAPERS

KINDS OF SCIENTIFIC PAPERS

First of all, let us consider the various kinds of scientific papers. In the sequence of the personal development of a scientific worker, perhaps we should first mention the thesis connected to a graduate student's degree research. The objective is mainly to train the future scientist in the fundamental process of formulating a problem, defining his specific approach, followed by a series of activities required for the solution of the problem, namely, examination of previous investigations to find clues for his present work, experimental details and analysis of experimental results. Originality is one of the prime requirements for a good graduate thesis, be that in the style of the solution of the problem in hand, including mathematical analysis, or in the technique adopted for experimental investigation. Generally, considerable details are needed to demonstrate the writer's ability to cope with the problem.

For most of us, we are constantly faced with the day-to-day problem of writing reports on laboratory investigations and results of concept development. The length and breadth of laboratory reports vary greatly. In general, periodic reports are written, which, after a stated period, are assembled into some kind of a final or terminal report at the conclusion of an investigation. These laboratory reports not only serve the purpose of informing other members of a research institution on the progress and especially important new findings on a standing research program, but the preparation of the report itself sets an investigator's perspective in order. At the moment, the habit of such progress report writing is greatly disinherited, particularly after the Cultural Revolution. In my opinion, this kind of report writing not only contributes to the efficient scientific administration of a research institution, but is also of immense significance to the intellectual development of a scientific worker. Even more neglected are reports which outline the formulation and development of new concepts, whithout which originality in scientific research is out of the question.

Now and then, a group leader or a division head needs to thumb through publications related to his field and finally write a review on the status of the art. Here, as a research worker, he should not lose sight of a different object for his

activity as compared to that of the professional literature searcher. He needs to weigh and consider the work of other investigators engaged in the field in order to generate new ideas for use in his own work. Rather than completeness, heurism will be his guideline when he examines the literature. In this kind of report writing, a research worker should always be aware of his distinction from a contributor, for instance, to a technical encyclopedia.

Perhaps the most difficult job for a scientific worker is writing for the uninitiated. He has to be not only capable of expounding a scientific or technical subject in non-scientific or non-technical terms, but also faithful to scientific or technical accuracy. To be more proficient, he needs also to be able to weave his own original concepts into the writing so as to be understandable and acceptable to the non-scientific or non-technical reader. This is a very practical problem particularly in applying for research fund or science awards.

COVENANTS FOR THE WRITER

As general principles for writing scientific papers, different as they are, I like to mention what I prefer to call the three covenants for writers. These I learned when I served as an editor of the English university newspaper when I was in college. The three covenants are:

1. For whom are you writing?
2. What are you going to write?
3. How are you going to write?

Consider these whom-what-how questions seriously before you put anything on paper, and you will notice the difference when you write.

Know your reader. One seldom writes for oneself. Anything that is written on paper is meant for some kind of readership, although readers differ widely in respect to what they want and what they can understand and accept. Therefore, it is of great importance to identify the sector of readership for which a paper is meant. A paper written in abstruse mathematical language cannot be appreciated by the practical engineer who is interested in something which may be of immediate use to him. On the other hand, for a scientific conference, a paper written in the style of a practicum (German: Praktikum) would probably put the author to disgrace. For use at a symposium, a long paper may rob the floor and incite the discontent of

other participants.

What to write. Like an experienced photographer who knows that a good picture can only represent one subject, the writer of a scientific paper needs to know exactly what he wants to transfer to the reader through the paper medium. Any poorly formulated problem can never be expected to carry the concept of a writer well however good it may be. A subject needs to be resolved into its component parts, and the writer needs to know exactly what to present in these separate descriptions and how to correlate these separate parts into a comprehensive whole. A scientific paper should be considered as a means for conveying to the reader certain information rather as an end by itself, and its writing is therefore justifiable only by the value of the contents.

How to write. Logical sequence ought to be observed in the process of conveying what is in the writer's mind to the reader in mind, as efficiently as possible. That calls for the use of concise and accurate language. Although the human thought process often calls for certain recycle and feedback in exposition, in order to inculcate important and difficult ideas, redundant structure needs to be avoided at all cost in any scientific writing. Unlike belles-lettres, the scientist has at his disposal tables, diagrams and even photographs to dispense with lengthy verbal description so as to accelerate the process of thought transfer. An idea often requires exploration from different angles for the sake of emphasis, although the style used has to be distinguished from simple repetition and verbosity. In general, a clear and persuasive language is preferred to engage the attention of the reader throughout the reading process, so as to make him accept the writer's point of view naturally, willingly and with little difficulty.

GENERAL STRUCTURE FOR A SCIENTIFIC PAPER

The title of a scientific paper comes first, but it is often the result of repeated revisions in the course of the preparation of the paper. To all intents and purposes, it should outline in as simple terms as possible the significant features of the paper. Superfluous wordings, such as "A report on ....," "Theory of ....," "Investigations on ....," etc., are to be avoided for the sake of streamlining the

thought-transfer process.

Then comes the abstract or summary. Although the abstract precedes all the rest of the paper, it is usually the last installment of the entire writing process. It sketches broadly the objective, the methodology and conclusions of the paper. A good abstract plays a decisive role in inducing a reader to continue reading beyond this point to the main contents.

Now we come to the beginning of the paper, the preamble, or the introduction. Some authors prefer not to prefix this part of a paper with the heading, INTRODUCTION, especially for a short paper. Here the problem is formulated and possibly explained, and the objective is defined. Often the approach to the solution is outlined with due emphasis on the originality of the author, which alone justifies publication.

Next the work of the previous investigators is reviewed with a weighted opinion as to the pros and cons on the views, conclusions, and methods of the past. In the case of large accumulation of previous material, it often facilitates communication by resorting to tabulation. Following that, the present approach may be restated in somewhat more detail to demonstrate the author's originality as distinguished from past work. Ambiguity in claiming the originality of the author's contribution may well be frowned upon by his peers, and it goes without saying that failure to mention or even shrewd ommission of similar previous work means poor professional ethics.

If the author's contribution includes certain systematic consideration, especially when mathematical analysis is involved, a special section on theory is provided. Brevity is often desirable, and emphasis is therefore devoted to the assumptions and conclusions with a few intermediate steps to illustrate the methodology, while details in regard to mathematical derivation and solution of equations are often relegated to an appendix. Except for the case of a graduate thesis or a detailed laboratory report, numerical results are not needed. Instead, curves and diagrams are more efficient in thought transfer.

Normally, a description on the experimental technique follows the theoretical analysis, but sometimes in development research, theoretical treatment is incorporated in the analysis of the experimental results. While dimensioned drawings are needed only for detailed reports of investigation, for presentation at conferences, schematic sketches of the experimental setup are preferred for better clarity. Materials used in testing, experimental procedure have to be mentioned, though briefly for most purposes. Details on design of apparatus, calibration curves as well as other unnecessary details, if included, only serve to divert the reader's attention from the main tenet. These are to be put in an appendix.

The purpose of all experimentation is to obtain certain factual results under specified conditons. These results have to be presented as faithfully as possible to reflect the objective world. The function of a research worker is to coordinate these facts, correlate them to related phenomena, compare and analyze the observations and measurements obtained in the experiments as accurately and as quantitatively as his ability permits. Again, the author needs to pay great attention to establish the main thesis of his contention, leaving the minor details to subordinate locations. If the author is possessed with extremely pregnant fresh ideas, the presentation of experimental results and the analysis of these results may be dealt with in two separate sections.

Lastly, comes the conclusion of the paper. It has to be succinct, accurate and well-pointed, answering particularly whether or not the objective of the investigation has been attained and what it consists of after all the toils of the investigator.

The mechanics of writing a scientific paper meant for the profession, calls for a list of notation on the symbols used and also a list of refrences. In citing previous work, self consistency in style is necessary, and the requirements of any publisher have to be followed strictly. It is rather deplorable that many a scientific worker is not even capable of using non-conflicting punctuations in a same list of references.

----- by Mooson Kwauk

----- by Guo Mucun

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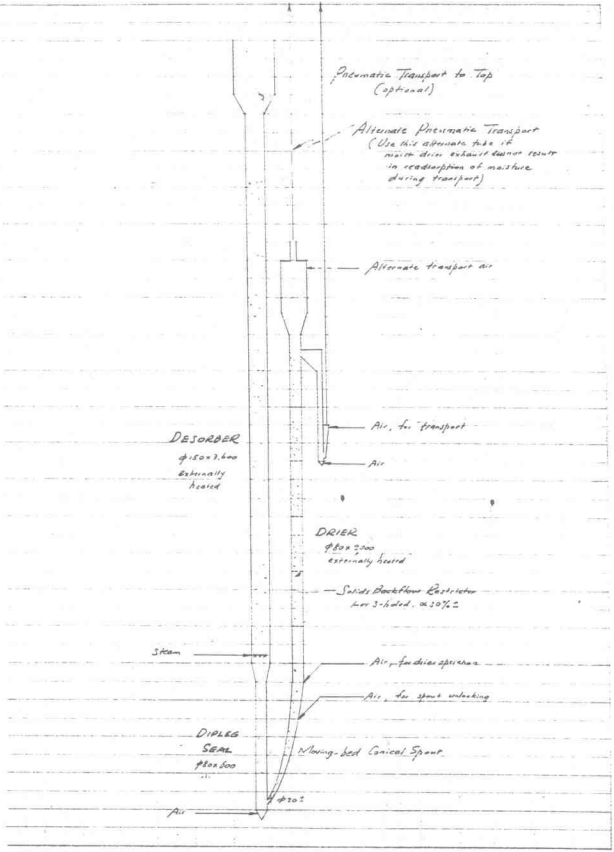

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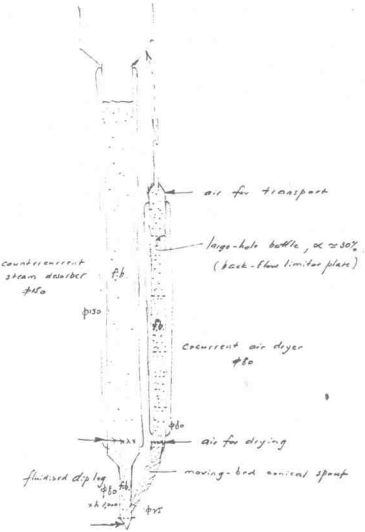

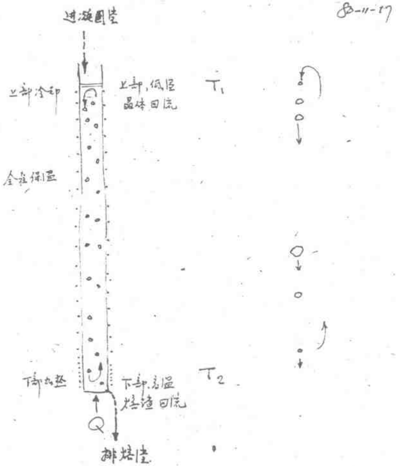

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晶体比重＞炉渣：晶体下沉　([illegible])