普通高等教育“十二五”规划教材

Professional English for Oilfield Chemistry

油田化学专业英语

乔庆东 李琦 李剑/主编

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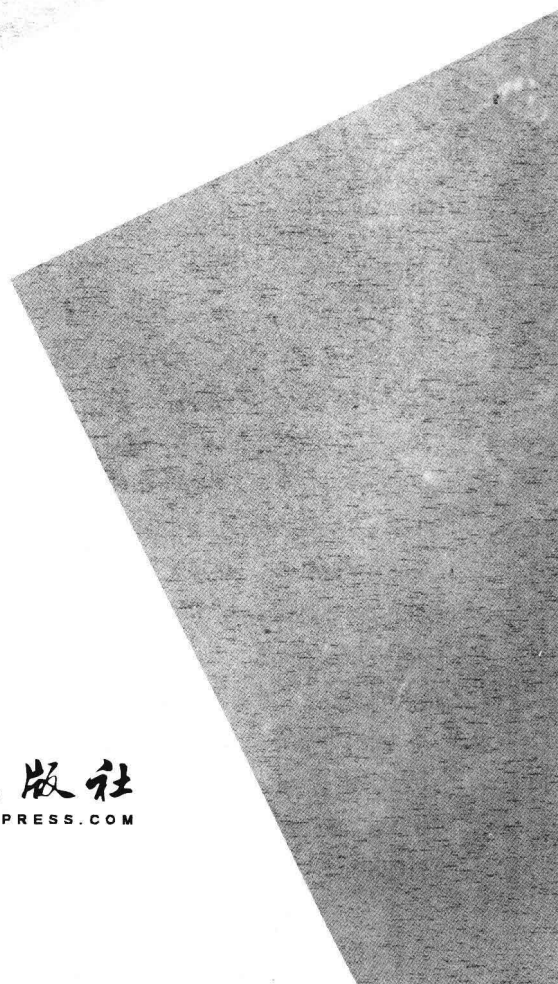

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前　言

学习专业英语，不但能提高专业英语的阅读能力，掌握科技论文的翻译和写作方法，还可以了解本专业最新的国内外发展动态，真是一举多得之幸事。本着该主导思想，我们精选了近几年发表或出版的有价值的英语原著或论文，并组织辽宁石油化工大学石油化工学院从事专业英语教学的教师，对原文进行了认真的编辑、注释和整理。课文内容涉及基础化学、精细化学和油田化学等，共由33篇课文组成，每篇课文都列出了重点专业词汇、注释和作业。此外附录中还列有化学元素的英文名及符号、常见玻璃器皿名称、化学上常见的缩略语、化学上常用的词头及词尾的含义、常用词头及词尾的含义、化学分子式、方程式及数学式的读法、总词汇表等。

课文1至9课由李琪完成，10至17课由李剑完成，18至33课及Appendix部分由乔庆东完成。全书由乔庆东统一编辑整理成稿。

本教材适用于应用化学专业(精细化工和油田化学)的本科生和研究生作为专业英语教材和读本。

书中错误之处，欢迎指正。

编　者

2011年6月

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Part I Fundemental Chemistry

Lesson 1 Chemistry and Chemist

Without chemistry our lives would be unrecognizable, for chemistry is at work all around us. Think what life would be like without chemistry—there would be no plastics, no electricity and no protective paints for our homes. There would be no synthetic fibres to clothe us and no fertilisers to help us produce enough food. We wouldn't be able to travel because there would be no metal, rubber or fuel for cars, ships and aeroplane. Our lives would be changed considerably without telephones, radio, television or computers, all of which depend on chemistry for the manufacture of their parts. Life expectancy would be much lower, too, as there would be no drugs to fight disease.

Chemistry is at the forefront of scientific adventure, and you could make your own contribution to the rapidly expanding technology we are enjoying. Take some of the recent academic research: computer graphics allow us to predict whether small molecules will fit into or react with larger ones—this could lead to a whole new generation of drugs to control disease; chemists are also studying the use of chemicals to trap the sun's energy and to purify sea water; they are also investigating the possibility of using new ceramic materials to replace metals which can corrode.

Biotechnology is helping us to develop new sources of food and new ways of producing fuel, as well as producing new remedies for the sick. As the computer helps us to predict and interpret results from the test tube, the speed, accuracy and quality of results is rapidly increasing—all to the benefit of product development.

It is the job of chemists to provide us with new materials to take us into the next century, and by pursuing the subject, you could make your positive contribution to society.

Here are some good reasons for choosing chemistry as a career.

Firstly, if you have an interest in the chemical sciences, you can probably imagine taking some responsibility for the development of new technology. New ideas and materials are constantly being used in technology to improve the society in which we live. You could work in a field where research and innovation are of primary importance to standards of living, so you could see the practical results of your work in every day use.

Secondly, chemistry offers many career opportunities, whether working in a public service such as a water treatment plant, or high level research and development in industry. Your chemistry-based skills and experience can be used, not only in many different areas within the chemical industry, but also as the basis for a more general career in business.[1] As a qualification, chemistry is highly regarded as a sound basis for employment.

You should remember that, as the society we live in becomes more technically advanced, the need for suitably qualified chemists will increase. Although chemistry stands as a subject in its own right, it acts as the bond between physics and biology. Thus, by entering the world of chemistry you will be equipping yourself to play a leading role in the complex world of tomorrow.

Chemistry gives you an excellent training for many jobs, both scientific and non-scientific. To be successful in the subject you need to be able to think logically, and be creative, numerate, and analytical. These skills are much sought after in many walks of life, and would enable you to pursue a career in, say, computing and finance, as well as careers which use your chemistry directly.

Here is a brief outline of some of the fields chemists work in:

Many are employed in the wealth-creating manufacturing industries—not just oil, chemical and mining companies, but also in ceramics, electronics and fibres. Many others are in consumer-based industries such as food, paper and brewing; or in service industries such as transport, health and water treatment.

In manufacturing and service industries, chemists work in Research and Development to improve and develop new products, or in Quality Control, where they make sure that the public receives products of a consistently high standard.

Chemists in the public sector deal with matters of public concern such as food preservation, pollution control, defence, and nuclear energy. The National Health Service also needs chemists, as do the teaching profession and the Government's research and advisory establishments.

Nowadays, chemists are also found in such diverse areas as finance, law and politics, retailing, computing and purchasing. Chemists make good managers, and they can put their specialist knowledge to work as consultants or technical authors. Agricultural scientist, conservationist, doctor, geologist, meteorologist, pharmacist, vet... the list of jobs where a qualification in chemistry is considered essential is endless. So even if you are unsure about what career you want to follow eventually, you can still study chemistry and know that you're keeping your options open.

What Do Chemistry Graduates Do?

Demand for chemists is high, and over the last decade opportunities for chemistry graduates have been increasing. This is a trend that is likely to continue. Chemistry graduates are increasingly sought after to work in pharmaceutical, oil, chemical, engineering, textile and metal companies, but the range of opportunities also spans the food industry, nuclear fuels, glass and ceramics, optical and photographic industries, hospitals and the automotive industry. Many graduates begin in scientific research, development and design, but over the years, about half change, into fields such as sales, quality control, management, or consultancy. Within the commercial world it is recognised that, because of the general training implicit in a chemistry course, chemistry graduates are particularly adaptable and analytical—making them attractive to a very broad spectrum of employers. There has been a growth of opportunity for good chemistry graduates to move into the financial world, particularly in accountancy, retail stores, and computer software houses.

Vocabularies

analytical [ˌænəˈlitikəl] *adj.* 分析的，解析的，善于分析的
automotive [ˌɔːtəuˈməutiv] *adj.* 汽车的，自动汽车的，机动车的
biology [baiˈɔlədʒi] *n.* 生物学，生态学
biotechnology [baiəutekˈnɔlədʒi] *n.* 生物技术，生物工艺学
brewing [ˈbruːiŋ] *n.* 酿造，酿造过程，酿造啤酒量，酿酒业
career [kəˈriə] *n.* 事业，职业，生涯
ceramic [siˈræmik] *adj.* 陶瓷的，陶器的，制陶艺术的；*n.* 陶瓷，陶瓷制品
conservationist [ˌkɔnsəˈveiʃənist] *n.* 自然资源保护论者
consultancy [kənˈsʌltənsi] *n.* 咨询公司，顾问工作
consultant [kənˈsʌltənt] *n.* 查阅者，请教者，商议者，顾问，咨询者

corrode [kə'rəud] *vt.* 侵蚀，损害；*vi.* 受腐蚀，起腐蚀作用
creative [kri'eitiv] *adj.* 创造性的
defence [di'fens] *n.* 防御，防卫，答辩，防卫设备
food preservation 食物保藏，食品保存
forefront ['fɔ:frʌnt] *n.* 最前线，最前部，最活动的中心
geologist [dʒi'ɔlədʒist] *n.* 地质学家，地质学者
implicit [im'plisit] *adj.* 含蓄的，暗示的，盲从的
innovation [ˌinəu'veiʃən] *n.* 创新，革新；新方法
meteorologist [ˌmi:tiə'rɔlədʒist] *n.* 气象学家，气象学者
molecule ['mɔlikjul] *n.* 分子，微小颗粒，微粒
National Health Service 国民医疗保健制度(英国)
nuclear energy 核能
numerate ['nju:məreit] *vt.* 数，列举，读(数)；*adj.* 识数的，会计算的
optical ['ɔptikəl] *adj.* 光学的，眼睛的，视觉的
pharmaceutical [ˌfɑ:mə'sju:tikəl] *adj.* 制药(学)的；*n.* 药物
pharmacist ['fɑ:məsist] *n.* 药剂师
photographic [ˌfəutə'græfik] *adj.* 摄影的，逼真的，(尤指记忆)详细准确的
plastics ['plæstiks] *n.* 塑料；*adj.* 塑料的
pollution control 污染控制
remedies ['remədis] *n.* 救济方法(remedy 的复数)
retail store [贸易] 零售商店
sought [sɔ:t] *v.* 寻找(seek 的过去式和过去分词)
spans [spænz] *n.* 跨度，一段时间(span 的复数)
subject ['sʌbdʒikt] *n.* 主题，科目
synthetic fibre 合成纤维
textile ['tekstail] *n.* 纺织品，织物；*adj.* 纺织的
trap [træp] *vt.* 诱捕，使……受限制，使……陷入困境；*n.* 陷阱，圈套
unrecognizable [ˌʌnrekəg'naizəbl] *adj.* 未被承认的，无法认出的

Notes

Your chemistry-based skills and experience can be used, not only in many different areas within the chemical industry, but also as the basis for a more general career in business.

由于在化学课程中得到了全面的技能和实验训练，你们不仅能适合于化学工业的各个领域，而且也使得你们倍受其他各行雇主的青睐。

Homework

Write a composition (300 ~ 400 words) titled "Chemistry around Us".

Lesson 2 Chemistry and Society

Chemistry: Science at the Molecular Frontiers

Chemistry is a broad science, embracing the concepts of creation of molecules and the manipulation of atoms and dealing with microscopic and macroscopic scales. It covers interactions with plants, animals and humans through agriculture, biology and medicine and with the physical world through electronics, new building materials and new sources of energy. It affects the people of our planet, protecting and preserving our health, ecology, culture and heritage.

While chemistry is a science in its own right, it also supports and interacts with other scientific disciplines. In concert with biology, physics, medicine, materials science and other core disciplines, it makes effective contributions to the solutions of problems facing the world today and to the improvement of the condition of mankind tomorrow. [1]

• *Chemistry forms the indispensable foundation of disciplines such as biology, medicine, and materials sciences.*

In leading technology towards the future, it should be remembered that chemistry is not a new science, but a steadily evolving discipline like physics and biology, interdependent on discoveries in other areas. It is a discipline that has long and deep traditions inEurope. It is responsive to the challenges of the European economy, the European environment and European culture and to the influences of scientific discovery elsewhere in the world.

Chemistry & Education

Universities provide teaching and training for bright young people in the basics of chemical science and engineering, both for students specializing in chemistry and for others who need the underpinning experience of chemistry for their own particular scientific, professional or technical education.

• *Universities have a vital role in the training of excellent people and as partners with industry in collaborative R&TD.*

Of course, provision of an educational training in chemistry does not begin at university. It starts at primary school with an introduction to observation and embryonic interpretation of phenomena and continues through early, middle and later schooling. There are deep worries within the chemistry community inEurope that the educational provision in science in some countries is lacking in appropriate resourcing and basic training, particularly in mathematical skills and in developing a comfortable familiarity with the philosophy of physical science.

• *Schools and school teachers, universities as teachers of teachers and adult teaching institutions all have a major contribution to make in improving society's knowledge of science and technology. Science teaching must be better funded and empowered through better training to deliver higher standards in science education. Education must continue for our workforce throughout the working life. Education must be seen as a European matter—a fundamental basis for a modern society.*

Fortunately, in most countries in Europe chemistry and chemical engineering are highly regarded as professions. However, in some countries this is not the case, with adverse consequences for practitioners of the sciences and public perception of its activities and benefits.

Much more effort must be put into the careful training and selection of science teachers, particularly chemistry teachers, and into the promotion of a more balanced view of the benefits as well as the responsibilities of chemistry as a science.

An improved standard of general science education for all Europeans is essential for future success. Without a knowledge of basic scientific matters, of concentration, of risk and probability, and of the properties of materials and molecules, a science-based industrial society cannot function democratically. As we see daily in our media, a society with widespread scientific ignorance is all too easily influenced by facts incorrectly reported or interpreted in an unbalanced way.

• *Wider scientific education and more effective programmes to increase public recognition of the positive role of chemistry in wealth creation and improving the quality of life are needed. Such programmes might usefully be initiated in consultation with the partners of the AllChemE.*

Academic institutions and the chemical industry accept that it is necessary to demonstrate that the advanced technology used in industry is both safe and responsibly managed.

Chemistry & Research

The chemical industry of Europe has grown to its present importance through a steady stream of innovation in products and processes. Many new ideas, concepts and techniques come from continual contact with fundamental and applied research in chemistry and chemical engineering. These provide the intellectual driving force of innovation. Without research in chemistry and chemical engineering there would be markedly fewer improvements in the quality of life.

The research activities described earlier in this report embrace most of contemporary chemistry, biochemistry, biotechnology and chemical engineering. It is from this base that new research in areas of strategic importance, and in areas that we cannot presently imagine, will spring.

Chemistry as a research area introduces to young doctoral trainees the excitement of the scientific frontier, providing experience in problem solving, information handling, organisation, interpretation and presentation. It teaches practical skills involving the manipulation of chemicals and the use of sophisticated analytical instrumentation for the interpretation of phenomena. The results of the research are of immediate benefit to other chemists and scientists in related disciplines and in many cases also to industrial R&TD groups. Chemistry is thus an interdisciplinary science with high industrial relevance.

• *Universities and research institutes have long been the source of new ideas for industry. Basic research in the best institutions must be funded effectively. Support of high quality fundamental research, chosen by peer review and funded on a responsive basis, encourages diversity through "curiosity-driven" impulses. This diversity promotes flexibility in developing new technological capabilities at national and supra-national levels.*

While chemistry, at the research level, is a relatively small-scale activity, often involving only small teams, it is essential to ensure proper provision of laboratory facilities to meet health and safety needs. State-of-the-art analytical instrumentation must be made available at the laboratory level and effective in-house research support should be provided.

It is also necessary to invest in large-scale instrumentation (neutron diffraction, synchrotron radiation, large-scale lasers, etc) whose expense precludes availability to individual small-scale laboratories. National and European funding for such research at both ends of the scale is of great importance in maintainingEurope's position in basic chemical science.

• *Chemistry laboratories in universities and research institutes need effective instrument provision through local, national and supranational facilities. They also need modern laboratories, equipped to modern safety standards, to conform to best practice in the training of researchers.*

There is a strong correspondence between academic training and research objectives and industrial research and development objectives. Links between academia and industry can operate in a variety of ways. These include a full contract between an industrial organisation or consortium with one laboratory, or a group of laboratories, engaged on pre-competitive or competitive research. The latter of necessity raises the issues of confidentiality and intellectual property. Looser contracts for general collaboration on generic research themes, designed to give industry a foothold or access to intellectual capability and expertise in an area of potential or presently peripheral interest, are also used. Transfer of personnel to and from academic laboratories for retraining, additional training and working on projects of potential, likely or immediate interest to the industrial sponsor are also increasingly common.

There is already a close and symbiotic relationship between industry and academia, a relationship which is a good model of effective collaboration. It can be improved and made more effective in some countries by adjustment of national taxation policy, thereby releasing additional funds for investment in R&TD, as occurs in the USA. While close integration with industrial R&TD will bring impressive gains, the exclusive emphasis on this form of collaboration could lead in the long term to the decline of chemistry as a distinct and innovative academic discipline.[2] A balance needs to be struck between fundamental research in academic institutions and collaborative research between academic institutions and industry. The chemical industry's collaborative programme, Sustainable Technology (SUSTECH), is a good example of this latter form of collaboration.

• *Public support of funding for collaborative R&TD is vital for the stimulation of R&TD addressing societal needs. The chemical industry has initiated programmes for this specific purpose which has achieved success in stimulating collaborative R&TD projects.*

Industrial Competitiveness

Universities and related academic institutions have an obligation to undertake training of scientific manpower at post-school (ca. age 19) level and at the doctorate level, with the needs of the "customer", usually but not exclusively the chemical industry, in mind. The chemical industry, in recognising its critical dependence on ac-

cess to highly trained, well-educated postgraduate chemists, strongly endorses that view.

The chemical industry recognises the need to safeguard its competitive position and is striving hard to maintain the flow of innovative products and processes which are more resource- and energy-efficient, which generate less waste and are kinder to the environment.[3] The industry's SUSTECH programme of collaborative R&TD with other sectors of industry, with universities and research institutions, is the industry's chosen vehicle for bringing this about. The AllChemE partners recognise their responsibility to ensure that society understands and accepts the need and desirability of these innovations.

• *The chemical industry regards the Framework Programmes of the EU as offering valuable support for its collaborative R&TD efforts. The industry works hard to make an effective contribution to the Fourth Framework Programme and wishes to play a full part in the formulation of the Fifth and subsequent Programmes.*

The chemical industry supports the concept of giving more societal and political relevance to the key industrial R&TD objectives and would like to see that carried further into the structure and content of the Fifth Framework Programme. As the supplier of new materials, the chemical industry has much to contribute to the formulation and implementation of the Programme, as has chemistry as an enabling science. To achieve this, we recognise the need to create a new mechanism to facilitate communication and coordination between the chemical industry, research laboratories, and the European Commission, in order to extract the maximum benefit from collaborative R&TD.

AllChemE, the European Commission and the Framework Programmes

The member groups of AllChemE believe that it is a task of national governments to resource fundamental research in terms of national strengths and needs. However, there are four main areas where the European Commission currently assists in the promotion of science and technology:

① in training, through mobility programmes

② by assistance in the provision of infrastructure such as the large-scale instrumental facilities

③ through networking, promoting collaboration between research teams either to achieve critical mass or multidisciplinarity to maximize efficiency in tackling contemporary problems

④ by coordination of national policies and Commission programmes in research

As has been emphasised throughout this report, pre- and post-doctoral training takes place in academic institutions and is carried out largely through fundamental research studies. The success of the former Erasmus and now the Socrates programmes has revealed the strong demand for mobility in training in Europe and AllChemE strongly supports this. The European Commission has greatly facilitated the breakdown of national barriers through the mobility of researchers carrying out training in Europe. This mobility should be increased, as should the coordination of research training through European networks in the Training and Mobility of Researchers (TMR) programme. However, there are no internal priorities within these programmes and there is no attempt to address the relationship between the excellent research activities and the needs of a very important and successful chemical industry.

• *Mobility of researchers within Europe encourages successful inter- and multi-disciplinary collaborations, enhances training and facilitates the development of core expertise within the science. It helps bridge the frontiers of national practices and prejudices. Programmes like Socrates and Training and Mobility for Researchers could be enlarged and should be generously funded.*

The Commission is encouraged to establish priorities within its programmes for mobility and training in consultation with the chemical industry and the academic world, thereby underpinning and therefore strengthening Europe's science and technology base. The implementation of new programmes should respond to and reflect these priorities.

Furthermore, chemistry and chemical engineering are dispersed through a variety of themes within the specific programmes of the Framework Programme. There is no special focus on the chemical industry. The Commission now has an opportunity to make possible a greatly improved contribution from research activities in chemistry across Europe, through better recognition of national strengths and priorities and through a scheme of thematic networks dedicated to exploratory research within the strategic domain.[4]

Chemistry & the Future

In the near future, taking into account the relationship between research in chemistry within academic institutions and the needs of industry, we can discern certain essential priorities. These are:

① the need for well-trained, imaginative molecule makers

② the need to encourage and deepen our understanding of the properties of matter and of the way in which and the speed at which chemical processes occur