四川理工学院课程实施大纲

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| **课程名称：专业外语** |
| **授课班级：高分子20141高分子20142** |
| **任课教师：邹智挥** |
| **工作部门：材料科学与工程学院** |
| **联系方式：mayko0301@hotmail.com** |

**四川理工学院 制**

**2017年 2月**

**《专业外语》课程实施大纲**

**基本信息**

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| 课程代码：  课程名称：专业外语  课程性质：基础必修  学分：2  总学时：30  学期：2016第2学期  上课时间：按照教务处安排  上课地点：按照教务处安排  答疑时间和方式：课间、平时答疑，电话或网络答疑（随时）  答疑地点：上课教室或第二实验楼3084  授课班级：材料2014高分子1，高分子2  任课教师：邹智挥  学院：材料科学与工程学院  邮箱：mayko0301@hotmail.com  联系电话：15182602402 |

**1、教学理念**

作为一名高校教师，在教学中注重“以学生为本”，重视研究性学习、探究性学习和协作性学习等现代教育理念的应用，以自己的“教”，来引导学生的“学”，对教学内容做精心取舍，以更好地培养学生的能力，努力成为学生的良师益友。

在教学方法上，大力提倡“学生参与”，采取分组讨论、案例分析等多样的教学方式，努力调动学生的积极性，培养学习兴趣，激发学习热情，使学生充分地参与到整个学习活动中。本着“教学相长”的理念，对于学生提出的问题与质疑，认真对待，耐心解答。

英语作为交流的工具，是一门应用性很强的学科，只有多听、多说、多读、多练才能真正掌握英语这一门语言。因此，在向学生讲解与本专业有关的专业词汇外，对学生强调以多练作为学习的方法与手段也是必要的。

**2、课程介绍**

专业英语是大学英语教学的一个重要组成部分，它促进了学生从学习英语知识向专业应用英语知识的转变，也为三、四年级的本科生阅读专业领域的英语教科书、参考书及文献资料等奠定良好的基础。专业英语的教学不仅仅要培养学生的专业文献阅读能力，更要侧重学生科技英文写作能力及专业语言的交流能力，它是连接大学英语与双语教学的桥梁。

本课程是高等学校本科材料和防腐类专业的必修课程，是学生在完成了英语基础阶段的学习任务后，需要修读的一门专业主干课。通过本课程的学习，使学生了解科技文献的基本结构和表达习惯，掌握与材料腐蚀相关的重要专业词汇，培养学生熟练阅读专业文献和用英语进行科技论文翻译与写作的基本能力，提高学生的综合素质。

学习本课程后，学生能掌握相当数量的专业词条和知识，了解专业科技英语及其翻译的特点，为进一步阅读本专业相关的英文书籍和文献，并将其译成通俗易懂的中文奠定坚实的基础。此外，还能掌握科技论文常用句式和大量专业词汇，可为专业领域内的英文摘要和论文撰写创造有利的条件。

**3、教师简介**

**3.1 教师的职称、学历**

曾春燕，博士、讲师。

**3.2教育背景**

2009.09~2011.07加拿大多伦多大学联合培养博士研究生

2007.09~2013.06合肥工业大学博士研究生

2003.09~2007.07 合肥工业大学本科

**3.3****研究兴趣（方向）**

无机功能材料的制备、表征与应用研究

**4、****先修课程**

大学英语、无机化学、材料化学、物理化学、材料科学与工程

**5、课程目标**

本课程是材料及防腐专业的一门重要必修课。通过本课程的学习，使学生掌握相当数量的专业词条和知识，了解专业科技英语及其翻译的特点，为进一步阅读本专业相关的英文书籍和文献，并将其译成通俗易懂的中文奠定坚实的基础。此外，学习本课程后，还能掌握科技论文常用句式和大量专业词汇，可为专业领域内的英文摘要和论文撰写创造有利的条件。

**6、课程内容**

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| --- | --- | --- | --- |
|  | 内容 | 要求及重点、难点 | 学时安排 |
| Part1  高分子专业外语文献选读 | Unit 1 What are polymers?  Unit 2 Chain Polymerization  Unit 3 Step-Growth polymerization  Unit4 Ionic Polymerization Unit 5 Introduction to Living Radical Polymerization  Unit 6 Molecular Weight and its Distributions of Polymers | 1. 进一步了解科技英语在文体、时态、词汇、句式等方面的特点 2. 提高专业文献阅读能力，句型分析能力   3. 掌握一些重要的专业英语词汇 | 24学时 |
| Part 2  英文科技论文的结构与写作 | Unit 7 The Structure of an Article  Unit 8 Style and Language  Part Ⅲ Abstract | 掌握科技英语的特点，科技论文的结构以及写作技巧，常用句式等 | 6学时 |

**7、课程实施**

**7.1 Unit 1 What are polymers?**

**（1）教学目标**

掌握课后常用专业术语，科技英语翻译标准-确切性；科技英语的翻译做到：明确、通顺、简练；翻译过程应做到深刻理解原文、确切表达译文、校核；了解金属腐蚀的原因和电化学腐蚀及其英文表达。

**（2）教学内容**

What are polymers? For one thing, they are complex and giant molecules and are different from low molecular weight compounds like, say, common salt.

To contrast the difference, the molecular weight of common salt is only 58.5, while that of a polymer can be as high as several hundred thousand, even more than thousand thousands.

These big molecules or ‘macro-molecules’ are made up of much smaller molecules, can be of one or more chemical compounds.

To illustrate, imagine that a set of rings has the same size and is made of the same material. When these things are interlinked, the chain formed can be considered as representing a polymer from molecules of the same compound.

Alternatively, individual rings could be of different sizes and materials, and interlinked to represent a polymer from molecules of different compounds.

This interlinking of many units has given the polymer its name, poly meaning ‘many’ and mer meaning ‘part’ (in Greek).

As an example, a gaseous compound called butadiene, with a molecular weight of 54, combines nearly 4000 times and gives a polymer known as polybutadiene (a synthetic rubber) with about 200’000molecular weight.

The low molecular weight compounds from which the polymers form are known as monomers. The picture is simply as follows:

butadiene + butadiene + ∙∙∙ + butadiene--→polybutadiene(4 000 time)

One can thus see how a substance (monomer) with as small a molecule weight as 54 grow to become a giant molecule (polymer) of (54×4 000≈)200 000 molecular weight.

It is essentially the “giantness” of the size of the polymer molecule that makes its behavior (different from that of a commonly known chemical compound such as benzene.)

Solid benzene, for instance, melts to become liquid benzene at 5.5℃ and , on further heating, boils into gaseous benzene.

As against this well-defined behavior of a simple chemical compound, a polymer like polyethylene does not melt sharply at one particular temperature into clean liquid.

Instead, it becomes increasingly softer and, ultimately, turns into a very viscous, tacky molten mass. Further heating of this hot, viscous, molten polymer does convert it into various gases but it is no longer polyethylene. (Fig. 1.1) .

Another striking difference with respect to the behavior of a polymer and that of a low molecular weight compound concerns the dissolution process.

Let us take, for example, sodium chloride and add it slowly to fixed quantity of water. The salt, which represents a low molecular weight compound, dissolves in water up to a point (called saturation point) but, thereafter, any further quantity added does not go into solution but settles at the bottom and just remains there as solid.

The viscosity of the saturated salt solution is not very much different from that of water. But if we take a polymer instead, say, polyvinyl alcohol, and add it to a fixed quantity of water, the polymer does not go into solution immediately.

The globules of polyvinyl alcohol first absorb water, swell and get distorted in shape and after a long time go into solution.

Also, we can add a very large quantity of the polymer to the same quantity of water without the saturation point ever being reached.

As more and more quantity of polymer is added to water, the time taken for the dissolution of the polymer obviously increases and the mix ultimately assumes a soft, dough-like consistency.

Another peculiarity is that, in water, polyvinyl alcohol never retains its original powdery nature [as the excess sodium chloride does] [in a saturated salt solution].

In conclusion, we can say that (1) the long time taken by polyvinyl alcohol for dissolution, (2) the absence of a saturation point, and (3) the increase in the viscosity are all characteristics of a typical polymer being dissolved in a solvent and these characteristics are attributed mainly to the large molecular size of the polymer.

The behavior of a low molecular weight compound and that of a polymer on dissolution are illustrated in Fig.1.2.

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| Polymer: 高分子,聚合物.(repeat units)  polymeric  polymerization  “poly-”: 多的,聚合的. Polygon, 聚醚？聚酯？聚酰胺？聚乙烯？多官能团？polyfunctional  “-mer”: part. Isomer, 同分异构体  Macromolecule: 大分子,高分子Macro-: 大 （反义词？）  Molecule, 分子 --------- Atom, 原子  Molecular Weight, 分子量  Micro-: 显微的。显微镜？Microscope. Microsoft  Monomer: 单体  “mono-”: 单个 . Monocrystalline，monodisperse，monofunction  “di-, bi-”: 双. “tri-”: 三个. “tetra-”:四个  Repeat Unit, 重复单元 ----- Monomer unit,单体单元  Synthetic, 合成的, 如Synthetic Rubber  Synthesis, n, 合成 --------Syntheses, vt, 合成  Butadiene: 丁二烯。 Butyl-：丁基。-ene：烯。-yne：炔。  乙烯？Ethylene . 1-丁烯？Butylene. 乙炔？Ethyne.  Polyethylene: 聚乙烯.  Ethyl-:乙基。 Ethylene: 乙烯。Ethane：乙烷  synthetic: 合成的。名词？动词？  Viscous：粘的。名词？  Plastics, 塑料 -------- Rubber, 橡胶 ------- Fiber, 纤维  Adhesive, 黏合剂 ----------- Paints, 涂料  Polybutadiene, 聚丁二烯  Polyvinyl alcohol, 聚乙烯醇  Polyvinyl chloride, 聚氯乙烯  Polyester, 聚酯  Polystyrene, 聚苯乙烯  Polypropylene, 聚丙烯  Polyethylene, 聚乙烯  Polyamide, 聚酰胺  Polyether:聚醚  Thermoplastics, 热塑性塑料  Thermosetting resin, 热固性树脂  Elastomers, 弹性体  Thermoelastomers, 热塑性弹性体  Homopolymers and copolymers, 均聚物和共聚物  Homo- ：均匀的。Homogenous:均相的  Hetero-：异的，不同的 heterogenous: 异相的  Block copolymers,嵌段共聚物  Random copolymers,无规共聚物  Alternating copolymers,交替共聚物  Terpolymers,三元共聚物  Graft copolymers,接枝共聚物 | Polyvinyl alcohol: 聚乙烯醇。 Vinyl：乙烯基  Sodium chloride, 氯化钠，  potassium sulfate, 硫酸钾；  sulfuric acid, 硫酸  Settle，使（液体）澄清，沉淀,沉降  Precipitate, 使沉淀，使凝结  Precipitant，沉淀剂  Stir, 搅拌  Saturation, 饱和 ------- Unsaturation, 不饱和  Dissolution, n,溶解 ------Dissolve, vt, 溶解  solution n 溶液; solution polymerization  solubility n 溶解度，溶解性  solvent n 溶剂, solvent effect  Viscous, a, 粘稠的 ----Viscosity, 粘度(性) Clean, 完全的，彻底的；  sharply, 明显地，精明地，敏锐地，突然地，急剧地  Increasingly, 越来越….，  Striking, 显著的， 引人注目的，  with respect to 关于，就……而论  Thereafter，此后  Distort，畸变，扭变，变形。  Consistency, 一致性，坚固性。  Peculiarity, 独特性，特色，特质，特殊的东西，怪癖。  issue from, 由…..产生，由…得出….  Adventitious [ædven’tiSəs],外来的，偶然的，abstract, 分离，转移  profound,意义深远的，深刻的，notably，显著的，著名的，  这个句型很有用 just as it is not necessary for …to be …, it is also not necessary for …to be… 正…不一定是….一样， ….也不一定是….  The moment, 一….就…….  Segment, 链段  Backbone, 主链，骨架(脊骨,脊柱)//skeleton, 骨骼,骨架（建筑）,骷髅  Skeleton atom (structure),骨架原子（结构）  substituent, substituted group,取代基  side（pendant,　lateral）group,侧基//end group,端基  Side chain, 侧链，支链  Side reaction, 副反应．  Linear polymers, 线型高分子//Nonlinear polymers,非线型高分子  Branched polymers,支化高分子  Crosslinked polymers,交联高分子  Stars and dendrimers,星型高分子及树枝状高分子  Ladder polymers,梯型高分子  Cyclolinear polymers,线型环聚合物//Cyclomatrix polymer,体型聚合物  Telechelic polymers,远鳌聚合物，遥爪聚合物  Mono-telechelic polymer,单遥爪聚合物  Di-telechelic polymer,双遥爪聚合物  Amorphous polymers,无定形高分子//Crystalline polymers,结晶高分子 |

**（3) 教学过程及方法**

1）采用教师示范领读，翻译；学生诵读、翻译、教师点评两种方式；

2）阐明科技英语与日常英语的差异。

3）逐句分析句子结构，重点抓住“主、谓、宾”句子主干进行分析。

**（4) 作业安排**

掌握unit 1课后常用专业术语；

翻译reading material 1第一段全部内容。

**Unit 2 Chain Polymerization**

**（1）教学目标**

掌握课后常用专业术语，不同腐蚀类型的英文表达以及科技英语中的省略句，熟悉科技英语中的被动句、条件句、非谓语动词及介词短语。

**（2）教学内容**

**Chain Polymerization**

Many olefinic and vinyl unsaturated compounds are able to form chain-like macromolecules through elimination of the double bond, a phenomenon first recognized by Staudinger. Diolefins polymerize in the same manner, however, only one of the two double bonds is eliminated.

Such reactions occur through the initial addition of a monomer molecule to an initiator radical or an initiator ion, by which the active state is transferred from the initiator to the added monomer.

In the same way by means of a chain reaction, one monomer molecule after the other is added (2000~20000 monomers per second) until the active state is terminated through a different type of reaction.

The polymerization is a chain reaction in two ways: because of the reaction kinetic and because as a reaction product one obtains a chain molecule. The length of the chain molecule is proportional to the kinetic chain length.

One can summarize the process as follow (R. is equal to the initiator radical):

 One thus obtains polyvinylchloride from vinylchloride, or polystyrene from styrene, or polyethylene from ethylene, etc.

The length of the chain molecules, measured by means of the degree of polymerization, can be varied over a large range through selection of suitable reaction conditions.

Usually, with commercially prepared and utilized polymers, the degree of polymerization lies in the range of 1000 to 5000, but in many cases it can be below 500 and over 10000.

This should not be interpreted to mean that all molecules of a certain polymeric material consist of 500, or 1000, or 5000 monomer units. In almost all cases, the polymeric material consists of a mixture of polymer molecules of different degrees of polymerization.

Polymerization, a chain reaction, occurs according to the same mechanism as the well-known chlorine-hydrogen reaction and the decomposition of phosegene.

The initiation reaction, which is the activation process of the double bond, can be brought about by heating, irradiation, ultrasonics, or initiators. The initiation of the chain reaction can be observed most clearly with radical or ionic initiators.

These are energy-rich compounds which can add suitable unsaturated compounds (monomers) and maintain the activated radical or ionic state so that further monomer molecules can be added in the same manner.

For the individual steps of the growth reaction one needs only a relatively small activation energy and therefore through a single activation step (the actual initiation reaction) a large number of olefin molecules are converted, as is implied by the term “chain reaction”.

Because very small amounts of the initiator bring about the formation of a large amount of polymeric material (1:1000 to 1:1000), it is possible to regard polymerization from a superficial point of view as a catalytic reaction.

For this reason, the initiators used in polymerization reactions are often designated as polymerization catalysts, even though, in the strictest sense, they are not true catalysts because the polymerization initiator enters into the reaction as a real partner and can be found chemically bound in the reaction product ,i.e. ,the polymer.

In addition to the ionic and radical initiators there are now metal complex initiators (which can be obtained, for example, by the reaction of titanium tetrachloride or titanium trichloride with aluminum alkyls), which play an important role in polymerization reactions (Ziegler catalysts) ,The mechanism of their catalytic action is not yet completely clear.

**（3) 教学过程及方法**

1）采用教师示范领读，翻译；学生诵读、翻译、教师点评两种方式；

2）逐句分析句子结构，重点讲解科技英语中的被动句、条件句、非谓语动词及介词短语。

**（4) 作业安排**

掌握unit 2课后常用专业术语；

掌握科技英语中被动句、条件句及介词短语的应用。

**UNIT 3. Step-Growth polymerization**

**（1）教学目标**

掌握课后常用专业术语，科技英语常用句型结构以及科技英语中的省略句；防腐措施的英文表达。

**（2）教学内容**

**Step-Growth polymerization**

Many different chemical reactions may be used to synthesize polymeric materials by step-growth polymerization. These include esterification, amidation, the formation of urethanes, aromatic substitution, etc.

Polymerization proceeds by the reactions between two different functional groups, e.g., hydroxyl and carboxyl groups, or isocyanate and hydroxyl groups.

All step-growth polymerization fall into two groups depending on the type of monomer(s) employed. The first involves two different polyfunctional monomers in which each monomer possesses only one type of functional group.

A polyfunctional monomer is one with two or more functional groups per molecule. The second involves a single monomer containing both types of functional groups.

The synthesis of polyamides illustrates both groups of polymerization reactions. Thus, polyamides can be obtained from the reaction of diamines with diacids or from the reaction of amino acids with themselves.

The two groups of reactions can be represented in a general manner by the equations as follows

Reaction (3.1) illustrates the former, while (3.2) is of the latter type.

Polyesterification, whether between diol and dibasic acid or intermolecularly between hydroxy acid molecules, is an example of a step-growth polymerization process.

The esterification reaction occurs anywhere in the monomer matrix where two monomer molecules collide, and once the ester has formed, it, too, can react further by virtue of its still-reactive hydroxyl or carboxyl groups.

The net effect of this is that monomer molecules are consumed rapidly without any large increase in molecular weight.

Fig. 3.1 illustrates this phenomenon. Assume, for example, that each square in Fig. 3.1a represents a molecule of hydroxy acid. After the initial dimmer molecules from (b), half the monomer molecules have been consumed and the average degree of polymerization (DP) of polymeric species is 2.

As trimer and more dimer molecules form (c), more than 80% of the monomer molecules have reacted, but DP is still 2.5. When all the monomer molecules have reacted (d), DP is 4.

But each polymer molecule that forms still has reactive end groups; hence the polymerization reaction will continue in a stepwise fashion, with each esterification step being identical in rate and mechanism to the initial esterification of monomers.

Thus, molecular weight increases slowly even at high levels of monomer conversion, and it will continue to increase until the viscosity build-up makes it mechanically too difficult to remove water of esterification or for reactive end groups to find each other.

It can also be shown that in the A-A+B-B type of polymerization, an exact stoichiometric balance is necessary to achieve high molecular weights. If some monofunctional impurity is present, its reaction will limit the molecular weight by rendering a chain end inactive.

Similarly, high-purity monomers are necessary in the A-B type of polycondensation and it follows that high-yield reactions are the only practical ones for polymer formation, since side reactions will upset the stoichiometric balance.

（3) 教学过程及方法

1）采用学生诵读、翻译，教师点评的方式；

2）重点分析科技英语中动词、名词、形容词等的词性转换。

**（4) 作业安排**

掌握unit 5课后常用专业术语；

阅读reading material 5，了解与腐蚀相关的期刊文献。

**UNIT 4 Ionic Polymerization**

**（1）教学目标**

培养学生科技英语的写作能力;能借助于词典等工具完成汉译英。

**（2）教学内容**

UNIT 4 Ionic Polymerization

Ionic polymerization, similar to radical polymerization, also has the mechanism of a chain reaction. The kinetics of ionic polymerization are, however, considerably different from that of radical polymerization.

(1) The initiation reaction of ionic polymerization needs only a small activation energy. Therefore, the rate of polymerization depends only slightly on the temperature.

Ionic polymerizations occur in many cases with explosive violence even at temperature. below 50℃(for example, the anionic polymerization of styrene at –70℃ in tetrahydrofuran, or the cationic polymerization of isobutylene at –100℃ in liquid ethylene ).

With ionic polymerization there is no compulsory chain termination through recombination, because the growing chains can not react with each other.

Chain termination takes place only through impurities, or through the addition of certain compounds such as water, alcohols, acids, amines, or oxygen, and in general through compounds which can react with polymerization ions under the formation of neutral compounds or inactive ionic species.

If the initiators are only partly dissociated, the initiation reaction is an equilibrium reaction, where reaction in one direction gives rise to chain initiation and in the other direction to chain termination.

In general ionic polymerization can be initiated through acidic or basic compounds.

For cationic polymerization, complexes of BF3, AlCl3, TiCl4, and SnCl4 with water, or alcohols, or tertiary oxonium salts have shown themselves to be particularly active. The positive ions are the ones that cause chain initiation. For example:

However, also with HCl, H2SO4, and KHSO4, one can initiate cationic polymerization. Initiators for anionic polymerization are alkali metals and their organic compounds, such as phenyllithium, butyllithium, phenyl sodium, and triphenylmethyl potassium, which are more or less strongly dissociated in different solvents.

To this group belong also the so called Alfin catalysts, which are a mixture of sodium isopropylate, allyl sodium, and sodium chloride.

With BF3 (and isobutylene as the monomer), it was demonstrated that the polymerization is possible only in the presence of traces of traces of water or alcohol.

If one eliminates the trace of water, BF3 alone does not give rise to polymerization. Water or alcohols are necessary in order to allow the formation of the BF3-complex and the initiator cation according to the above reactions. However, one should not describe the water or the alcohol as a “cocatalyst”.

Just as by radical polymerization, one can also prepare copolymers by ionic polymerization, for example, anionic copolymers of styrene and butadiene, or cationic copolymers of isobutylene and styrene, or isobutylene and viny ethers, etc.

As has been described in detail with radical polymerization, one can characterize each monomer pair by so-called reactivity ratios r1 and r2.

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**（3) 教学过程及方法**

1）采用教师讲授与学生提问相结合的教学方式；

2）重点分析科技论文的结构，写作方法等。

**（4) 作业安排**

阅读reading material 6，写一篇cover letter。

**（5) 参考文献**

**UNIT 5 Introduction to Living Radical Polymerization**

**（1）教学目标**

掌握科技论文的几种形式以及常见的论文结构包括哪些部分，以及每部分的写作格式。

**（2）教学内容**

**Introduction to Living Radical Polymerization**

Traditional methods of living polymerization are based on ionic, coordination or group transfer mechanisms.

Ideally, the mechanism of living polymerization involves only initiation and propagation steps.

All chains are initiated at the commencement of polymerization and propagation continues until all monomer is consumed.

A type of novel techniques for living polymerization, known as living (possibly use “controlled” or “mediated”) radical polymerization, is developed recently.

The first demonstration of living radical polymerization and the current definition of the processes can be attributed to Szwarc.

Szwarc。

Up to now, several living radical polymerization processes, including atom transfer radical polymerization (ATRP), reversible addition-fragmentation chain transfer polymerization (RAFT), nitroxide-mediated polymerization (NMP), etc., have been reported one after another.

The mechanism of living radical polymerization is quite different not only from that of common radical polymerization but also from that of traditional living polymerization.

It relies on the introduction of a reagent that undergoes reversible termination with the propagating radicals thereby converting them to a following dormant form：

The specificity in the reversible initiation-termination step is of critical importance in achieving living characteristics.

This enables the active species concentration to be controlled and thus allows such a condition to be chosen that all chains are able to grow at a similar rate (if not simultaneously) throughout the polymrization.

This has, in turn, enabled the synthesis of polymers with controlled composition, architecture and molecular weight distribution.

They also provide routes to narrow dispersity end-functional polymers, to high purity block copolymers, and to stars and other more complex architecture.

The first step towards living radical polymerization was taken by Ostu and his colleagues in 1982.

In 1985, this was taken one step further with the development by Solomon et al. of nitroxide-mediated polymerization (NMP).

This work was first reported in the patent literature and in conference papers but was not widely recognized until 1993 when Georges et al. applied the method in the synthesis of narrow polydispersity polystyrene.

The scope of NMP has been greatly expended and new, more versatile, methods have appeared.

The most notable methods are atom transfer radical polymerization (ATRP) and polymerization with reversible addition fragmentation (RAFT).

Up to 2000, this area already accounted for one third of all papers in the field of radical polymerization, as shown in Fig.5.1.

Naturally, the rapid growth of the number of the papers in the field since 1995 ought to be almost totally attributable to development in this area.

**（3) 教学过程及方法**

1）采用教师讲授与学生提问相结合的教学方式；

2）重点分析科技论文各部分的写作格式和方法，以及常用句式。

**（4) 作业安排**

阅读reading material 7，熟悉科技英语写作常用句式。

**Unit 6 Molecular Weight and its Distributions of Polymers**

**（1）教学目标**

了解科技论文写作中容易出现的语法错误，以及投稿过程中可能出现的几种状态，以及如何用英文表达。

**（2）教学内容**

**Molecular Weight and its Distributions of Polymers**

The molecular weight of a polymer is of prime importance in its synthesis and application.

The interesting and useful mechanical properties which are uniquely associated with polymeric materials are a consequence of their high molecular weight.

Most important mechanical properties depend on and vary considerably with molecular weight.

Thus, strength of polymer does not begin to develop until a minimum molecular weight of about 5000～ 10 000 is achieved.

Above that size, there is a rapid increase in the mechanical performance of polymers as their molecular weight increases; the effect levels off at still higher molecular weights.

In most instances, there is some molecular weight range in which a given polymer property will be optimum for a particular application.

 In most instances, 在大多数情况下 最适条件，最适度，最适合的

The control of molecular weight is essential for the practical application of a polymerization process.

Be essential for…, 对……是必需的

When one speaks of the molecular weight of a polymer, one means something quite different from that which applies to small-sized compounds.

Speak of…，谈到……..

Polymers differ from the small-sized compounds in that they are polydisperse or heterogeneous in molecular weight.

Differ from…，与……..不同，或不一致。 Polydisperse, 多分散性的 Heterogeneous,不均匀的，非均相的，

Even if a polymer is synthesized free from contaminants and impurities, it is still not a pure substance in the usually accepted sense.

Free from…,没有……，无…….. Contaminant,污物 Impurity, 杂质 In the usually accepted sense…，在能被人们广泛接受的意义上

Polymers, in their purest form, are mixture of molecules of different molecular weights.

The reason for the polydispersity of polymers lies in the statistical variations present in the polymerization processes.

When one discusses the molecular weight of a polymer, one is actually involved with its average molecular weight.

Both the average molecular weight and the exact distribution of different molecular weights within a polymer are required in order to fully characterize it.

In order to, 为了……

The control of molecular weight and molecular weight distribution (MWD) is often used to obtain and improve certain desired physical properties in a polymer product.

Various methods are available for the experimental measurement of the average molecular weight of a polymer sample.

These include methods based on colligative properties, light scattering, viscosity, ultracentrifugation, and sedimentation.

Colligative property, 依数性； Light scattering, 光散射 Viscosity,粘度法 Ultracentrifugation, 超速离心分离 Sedimentation,沉降法

The various methods do not yield the same average molecular weight.

Different average molecular weights are obtained because the properties being measured are biased different toward the different sized polymer molecules in a polymer sample.

Some methods are biased toward the larger sized polymer molecules, while other methods are biased toward the smaller sized molecules.

The result is that the average molecular weights obtained are correspondingly biased toward the larger or smaller sized molecules.

The most important average molecular weights which are determined are the number-average molecular weight Mn, the weight-average molecular weight Mw and the viscosity-average molecular weight Mv.。

In addition to the different average molecular weights of a polymer sample, it is frequently desirable and necessary to know the exact distribution of molecular weights.

A variety of different fractionation methods are used to determine the molecular weight distribution of a polymer sample.

A variety of…,各种各样的 Fractionation[frækSə’neiSən],分级

These are based on fractionation of a polymer sample using properties, such as solubility and permeability, which vary with molecular weight.

Solubility, 溶解性 Permeability, 渗透性

**（3) 教学过程及方法**

1）采用教师讲授与学生提问相结合的教学方式；

2）重点讲解科技论文写作中容易出现的语法错误。

**（4) 作业安排**

阅读reading material 8，熟悉科技论文投稿过程中可能出现的几种状态。

**Part Ⅲ Abstract**

**（1）教学目标**

了解英文摘要写作的重要性，掌握英文摘要的内容，撰写英文摘要的步骤以及英文摘要写作技巧。

**（2）教学内容**

摘要(abstract，亦称文摘)作为对研究论文正文的精炼概括，非常便于读者在最短的时间内了解全文内容。随着国际检索系统的出现，摘要逐渐成为一种信息高度密集的相对独立文体，为人们在浩如烟海的文献中寻找所需要的信息提供了便利。

目前英文摘要存在的普遍弊病是可读性不强，信息量不够。英文摘要的语言必须符合英语的语法规定和表达习惯。许多出版物都对摘要有特定的要求，出版社通常在“guidelines for authors”中提供详细要求。这里只对通用的英文摘要的写作方法作简单介绍。

**1**．摘要的内容

(1) 研究的目的(objective or purpose)。

(2) 研究的过程与采用的方法(process and methods)。

(3) 主要结果或发现(results)。

(4) 主要结论或推论(conclusion)。

**2**．撰写摘要的基本步骤

摘要写作可按如下顺序写：

第一句：讲一下你这篇文章的研究意义（但是有的杂志不需要这句话）。

第二句：以To elucidate the mechanism..., To investigate...., 或for the purpose of....开头来讲述你这样研究的目的。

第三句：.... was carried out .... with ...treatment. 讲述你研究的内容，研究的方法。

第四句：The resulted showed that ......, 讲述你这样研究得出的主要研究结果。

第五句：The result of the present work implied that... 讲述由你的研究结果得出的结论。

另外，在摘要中不要用到参考文献，如果一定要用的话，那么一定要将全部的细节写出来。要始终记住一点，Abstract 是一个独立的部分，换句话说，别人不看你的文章，只看你的Abstract 就能了解你的研究工作。

**3**．摘要写作技巧

(1) 首句的撰写

读者阅读摘要时主要关注result、conclusion、新的方法或者与自己研究相关的方法，因而，摘要的首句简单陈述研究的subject or object即可。

例如：The present paper reports a study of three cases presenting the pathological aspect of chronic nonevolutive MS，corresponding to a clinical picture of benign MS．

为避免介绍一般性的标题或背景信息。一个简单有效的方法是开始句用“This paper”，“This study”，“This research”；首句也可以很简洁地转入研究主旨。

例如：Hypotheses are developed and tested about the characteristics of organizations and their environments that favor the proliferation of detailed job titles to describe work roles．

由于摘要常紧接标题，若标题已清晰表达出研究的目的，则首句不要重复或解释标题的内容。此时摘要可以直接从方法部分开始写。

摘要的首句若为其他文献作者报道、讨论或综述的内容，则用过去时或现在完成时；表达着手研究时所确定的目的即研究目的时一般用过去时；表达文本的目的即叙述的目的时用一般现在时。

(2) 方法与结论结果部分的撰写

研究的过程与方法这部分内容依赖于论文的创新性和重要性，重点是介绍新的重要材料与方法：新化合物、新设备、新分析方法等。若所用的方法是学科中标准的、众所周知的、或方法的名称可查到的，在摘要中就可以省略这部分内容，直接由目的部分转到结果部分。结果是研究同行最关注的部分，因而结果部分是摘要的主要部分。

若研究是由一系列实验组成，所得结果则尽可能都合并起来共同给出，因为分别给出显得比较重复，也比较浪费版面。

如果研究的焦点是新方法或新技术，则摘要的大部分应该用于对方法进行详尽描述，结果可以写得简单些，只占摘要的一小部分。

若研究所用的方法比较复杂，也可以用比较长的篇幅进行详细叙述。

摘要常常与题目在一起，若论文的主题在题目中已清楚说明，则在摘要中就不要再重复，此时摘要就可以直接从描述研究的方法开始。

方法和结果部分不能写注释或讨论的内容。在论文中常常将数据简化为图表形式，许多结果均是用图、表及其他形式表达的，但是此方法不适用于摘要；在一般情况下，大多数的数学推理和数学证明不宜放入摘要，应该省略。

(3) 讨论和结论部分的撰写

虽然讨论(discussion)部分在论文的正文中很重要，但是在摘要中只需要结论(results)部分，却不需要讨论。这是因为研究者肯定会在其后续的相关工作中借鉴使用其中所报道的方法和结果，但是对结果所做的解释(即讨论部分)受一些因素的影响，随着时间的推移，原来的解释可能会发生变化，甚至在论文刚印刷出版后会很快发生变化。虽然讨论是科学研究中最引人注目的部分，但由于它的时效性，讨论一般不写入摘要。

结论通常采用直接陈述的方式，当结论无法很具体时，可采用“The implications of the data are discussed in detail．”等句子表述研究结果，结论也可以是对研究发现的解释或是对有意义结果的建议，但对研究工作的建议和未来的计划一般不写入摘要。

结论的顺序一般遵循论文各部分内容的次序，这样更有助于读者回想并理解全文的内容。但是，有时由于研究本身的特点或所关注的重点不同，使摘要中各部分的次序发生变化。

一篇好的摘要通常主要由研究方法和结果组成，由首句表达研究的目的，随后的句子表明得到的结论。当然这样的顺序不是一成不变的，它随着所做研究的具体情况不同而变化。

(4) 语态和时态的运用

①语态。摘要一般很短，尽量不要混用各种语态，更不要在一个句子里混用。科技论文主要说明事实，一般用被动语态。但由于主动语态比被动语态语感强，表达有力，可能情况下尽量用动词的主动语态。使用主动语态有助于避免过多使用类似于“is”、“was”、“are”和“were”这样的系动词。

例如：用“Iron-containing bauxites sweeten gasolines in the presence of air．”比用“Gasolines are sweetened by iron-containing bauxites in the presence of air．”要好。但用“The relative adsorption coefficients of ether, water, and acetylene were measured by…”比用“…measured the relative adsorption coefficients of ether, water, and acetylene．”要规范。“A exceeds B”读起来要好于“B is exceeded by A”。

在英语科技论文中，摘要中常见的被动态句型有以下几种。

The principle of…is outlined．本文概述……的原则。

The apparatus for…is described．本文描述…的装置。

An account of…is given．本文叙述……。

The use of…is addressed．本文论述……的应用。

The mechanism of…is examined．本文探讨……的机理。

The dependence of…was established．本文确定……的关系。

An analysis of…was carried out．本文作了……的分析。

以上句型中的谓语动词还常用be studied，be determined，be investigated，be presented, be proposed，be obtained等。

②时态

通常情况下，摘要中谓语动词的时态和语态都不是通篇一律的，而应根据具体内容而有所变化，否则容易造成理解上的混乱。但这种变化又并非无章可循，其中存在着如下一些规律。

叙述研究过程，多采用一般过去时。

在采用一般过去时叙述研究过程当中提及在此过程之前发生的事时，宜采用过去完成时。

说明某课题现已取得成果，宜采用现在完成时。

摘要开头表示本文所“报告”或“描述”的内容，以及摘要结尾表示作者所“认为”的观点和“建议”的做法时，可采用一般现在时。

(5) 摘要写作注意事项。

①尽量用第三人称。第一人称作主语往往带有强烈的个人感情色彩，不宜多用。至于主题句，可以用主动语态，主语为“作者”、“本文”或“本论文的目的……”；也可用被动语态。通常情况下使用如：“对……进行研究”，“进行……调查”，“分析了……现状”等，尽可能少用或不用“本文”、“作者”、“笔者”等。

②正确使用专业术语：避免使用对此项研究不熟悉的读者难以理解的专业术语、缩略语、简称及符号。为方便索引，应给出主要术语的缩写和全拼两种形式(通常第一次使用全拼形式)。缩略语和简称在摘要中首次出现宜用全称给出定义，加以说明。不应使用非公认的符号。特殊字符(数学符号)及希腊字母尽量不用或少用。不应单独使用研究论文中出现的名词或词组的缩写。

③尽量不用非文字内容。摘要一般尽可能采用文字形式。不使用图表与公式等非文字内容。摘要中的内容不加脚注。

④注重逻辑连接与连贯。多数作者不重视摘要的逻辑连接与连贯，只是逐句进行罗列，很少有巧妙的连接，使摘要的可读性大打折扣。所以在摘要写作中要注意通篇的衔接手段，特别是隐性的衔接手段(词汇手段)可将摘要组成一个意义紧密相接的整体，从而可以保证摘要意义清晰。

⑤突出重点。对新内容要重点详尽写出，着重反映创新点及取得的研究成果，取消或减少背景信息。若背景信息所占篇幅过大，会使作者所做工作显得过于笼统和简单。论文摘要的文字必须十分简练，内容亦需充分概括，篇幅大小一般限制其字数不超过论文字数的5%。例如，对于一篇6000字的论文，其摘要一般不超出300字。

摘要应用重要的事实开头，尽量避免用辅助从句开头；构成句子时，动词应靠近主语；避免罗列一大堆数据；去除本学科领域常识性内容；未来计划不列入摘要；不应引用参考文献；不应有正文中未涉及的内容；不写无用的语句，应客观、如实地反映所做的研究工作，作者不必进行自我评价；英美拼写保持全文风格一致，尽量用简短、词义清楚并为人熟知的词。

⑥论文摘要“五不”。不要列举例证，不讲研究过程，不用图表，不给化学结构式，不作自我评价。

**（3) 教学过程及方法**

采用教师讲授与学生提问相结合的教学方式

**（4) 作业安排**

阅读reading material 9，根据要求翻译一篇摘要。

**8、课程要求**

英语作为一门语言，最重要的是训练，听说读写的能力都是训练得来的。科技英语是基于普通英语之上的，建议同学们积极参与课堂提问及课堂讨论，同时在课下广泛涉猎与专业英语相关的著作、资料、新闻等，以提高学习兴趣，训练自己的专业英语的阅读和写作能力

**9、课程考核**

**9.1 出勤要求**

出勤：本课程的学习中，选课同学应该主动遵守四川理工学院学生管理条例中关于出勤的相关政策规定。本课程将采用倒扣分的形式，即对无故缺席的同学（包括课后补假的同学），每缺席1次平时成绩扣5分，直至扣完。此外，本课程允许每一位同学无理由请假2次，但需在授课前提交请假条。

迟到与早退：上课铃后进入教室的同学算迟到，下课铃响前擅自离开教室的同学算早退。5次无故迟到10分钟及10分钟以内的同学算缺席1次，1次无故迟到10分钟及10分钟以上的同学算缺席1次；1次无故早退的同学算缺席1次。**9.****2成绩的构成与评分规则说明**

根据2015年专业外语课程教学大纲要求，总评成绩主要由平时成绩组成，占100%。平时成绩主要由出勤、课堂发言、课后作业、课程报告组成。出勤不加分，仅扣分，具体扣分细节详见9.1节出勤考核方式；课堂发言主要采用同学主动发言或随机抽点的方式，教师根据题目的难易程度以及回答情况给出等级分数。每一次课后作业根据同学完成情况给出等级分数，该次作业未交者按等级“E”计，补交作业按等级“D”计。课程报告根据同学的完成情况给出等级分数。等级分数与百分制分数换算亦详见下表。

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 等级 | A+ | A | A- | B+ | B | B- | C | D | E |
| 分数 | 98 | 95 | 90 | 88 | 85 | 80 | 70 | 60 | 0 |

在出勤不扣分的情况下，最终平时成绩为每一次课堂发言、课后作业、课程报告换算成百分制分数的算术平均分。若存在出勤扣分，平时成绩为先按出勤不扣分的情况计算的算数平均分，然后再依出勤扣分标准计算最终平时成绩。

**9.3****考查形式及说明**

通常情况下，《专业外语》课程为考查课，具体考试要求按四川理工学院教务处规定执行。如果该课程总评成绩不及格（即该课程总评成绩<60分），将有且仅有一次补考机会，如果补考仍不及格，则需要重修本课程。

**10、考试违规与作弊处理**

按照学校规定执行。

**11、课堂规范**

1. 学生必须按时上课，不得无故旷课、迟到或早退。
2. 学生上课应有秩序地进入教室，不得抢占座位。应保持教学楼的肃静。
3. 课堂内学生应认真听讲，遵守课堂纪律。下课后应主动安排同学擦黑板。
4. 学生不得穿背心、内裤、拖鞋进教室，不准在教室内抽烟。
5. 学生应自觉保持保持教室整洁，不得随意吐痰、乱丢果皮、纸屑，严禁在桌椅上刻画。
6. 学生应爱护教室内的一切公物，不得搬走桌椅、不准取走电器设备，损坏公物照价赔偿。

**12、课程资源**

教材与参考书

教材：崔学军主编. 《腐蚀与防护专业英语》. 自贡：四川理工学院教材科，2015

推荐参考书：

1. 匡少平，王世颖. 材料科学与工程专业英语. 北京：化学工业出版社, 2010.

2. 李洪涛，费维栋. 材料科学与工程专业英语. 哈尔滨：哈尔滨工业大学出版社, 2001.

**13、教学合约**

学术诚信最基本的原则是学生必须保证所提交的作业是自己所做。如果在完成课业时，请教了其他同学、老师，必须在作业中注明。

学习小组是非常有益的教育途径。鼓励同学们在完成作业、准备考试时相互之间进行讨论，只要在作业最后注明参考文献、合作者信息（其目的是要感谢他对你的工作所做的贡献），在完成作业时同学之间的相互合作是允许的。未有参考文献说明，逐字照抄其他人的答案或部分答案都是学术欺诈，其他同学对你的答案有贡献但你却未注明就是作弊。

课业完成后进行的考试过程中，不得采用不诚实、欺诈或未经认可的任何手段力图通过考试或获取好成绩。学术诚信问题零容忍，学术欺诈或考试作弊行为一经证实，该课程成绩将被判不及格，情节严重者将上报学校。请同学们高度重视学术诚信问题，严格要求自己，遵守四川理工学院相关的管理规范要求。

如果同学们有对本课程实施的意见和建议，欢迎大家提出，或对你自己做更多介绍，以便我对你有更多了解。

**14、课程合作协议**

1我已阅读课程实施大纲并理解其内容；

2我同意遵守课程实施大纲中阐述的标准和期望；

3 我同意遵守本课程实施大纲中所阐述的课程考核方式、学术诚信规定、课堂规范等。

签名：

日期：