

# Teaching Reform and Discussion on the Course “Synthesis and Preparation of New Materials” for Inorganic Nonmetallic Materials Engineering Major

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**Abstract:** Driven by the development of industrialization, the automotive industry, aerospace industry and new energy industry are also developing rapidly at the moment, which also makes inorganic non-metallic materials engineering attract more attention at present. In this major, “Synthesis and Preparation of New Materials” is one of the professional basic courses, which belongs to the transition course between professional disciplines and public basic courses for inorganic non-metallic materials engineering majors. With the overall improvement of my country’s industrial level and engineering development level, the number and types of various new materials are also increasing. For the engineering major of inorganic non-metallic materials, it is necessary to do a good job in the teaching reform of the course “synthesis and preparation of new materials” work, improve the quality of teaching, and lay a solid foundation for the study of the following professional courses. This paper gives an overview of the course “Synthesis and Preparation of New Materials”, and proposes the teaching reform strategy of “Synthesis and Preparation of New Materials” for the specialty of inorganic non-metallic materials engineering, in order to provide references for future related research.

**Keywords:** Engineering specialty of inorganic non-metallic materials; “Synthesis and preparation of new materials”; Teaching reform

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## Introduction

Material science appeared in the 1950s. Because it conforms to the trend of social development, it has developed rapidly after it appeared. Up to now, material science has become a science and technology alongside information science and energy science. In the field of materials, inorganic materials are an important component, especially the synthesis and preparation of materials, and it is a key factor in the development of related materials research.

### 1. Overview of the course “Synthesis and Preparation of New Materials”

With the continuous improvement of the development level of materials science, it has also led to the continuous development of inorganic non-metallic materials engineering. “Synthesis and Preparation of New Materials” is a basic course for materials science and inorganic non-metallic materials engineering majors. The course revolves around the basic content of materials science, provides an overview of the relevant content of inorganic materials, and analyzes synthetic methods and new materials. In terms of teaching objectives, “Synthesis and Preparation of New Materials” aims to enable students to master the basic theoretical knowledge of the synthesis and preparation of new materials, and master the basic synthesis methods and preparation methods of new materials through the study of this course. The study of the course prepares for the work<sup>[1]</sup>.

### 2. Teaching Reform Strategies of “Synthesis and Preparation of New Materials” for Inorganic Nonmetallic Materials Engineering Major

## 2.1 Teaching content

In the process of reforming teaching content, teaching materials, as an important part, are not only the material carrier of teaching content, but also a basic tool for teaching. Choosing reasonable teaching materials can play an important role in ensuring the smooth progress of teaching reform. promotion. In the selection of teaching materials, since the inorganic non-metallic materials project was established in my country in 2011, the number and types of teaching materials have been relatively large, and different teaching materials also have great differences in the focus, which needs to be combined with the actual situation. The selection of teaching materials is carried out according to the situation <sup>[2]</sup>

After the textbook is selected, the engineering of inorganic non-metallic materials involves many knowledge points, and the content is very extensive, and the application of the knowledge points is very strong. In the process of teaching reform, it is necessary to optimize the teaching content so that students can master more knowledge in the limited teaching time. Because some of the content in this textbook is similar to what has already been learned, for example, the basic knowledge content of the first chapter of the textbook is basically similar to the content of the textbook "Basics of Inorganic Materials Science", so it is not necessary to explain it in class, which can be reviewed by the students themselves.

In the inorganic material synthesis experiment technology, because of its similarities with the chemical principles, instrument analysis and analytical chemistry that have been learned, in the process of teaching reform, the content of this part also needs to be optimized. Based on the knowledge points that have been learned, the introduction of new knowledge is carried out, and the new knowledge points need to be explained. Taking the separation and purification technology of substances as an example, it can be combined with the separation methods that the students have learned to classify the separation and purification methods, summarize the separation principles and purification principles, and introduce the absorption, adsorption, and membrane separation technologies. to the knowledge point. In the chapter of modern synthesis methods of inorganic materials, due to the lack of the more commonly used electrochemical synthesis content, and the content described in the thermal synthesis of hydrothermal solvents, microwave and plasma synthesis is not detailed enough, and lack of the latest application case<sup>[3]</sup>.

## 2.2 Teaching mode

### 2.2.1 Information Technology Teaching Mode

With the continuous development of science and technology, the application scope of information technology is constantly expanding. The application of information technology in the field of education can play an important role in promoting the quality of teaching. In carrying out the teaching reform of "Synthesis and Preparation of New Materials" in the engineering specialty of inorganic non-metallic materials, teachers also need to reform the traditional single teaching mode and introduce information technology to carry out teaching work. Because of the information technology teaching method, the content of the teaching material can be visually displayed in front of the students through video, etc., which is convenient for students to understand the meaning of knowledge points, and can also stimulate students' thinking about knowledge points and improve the quality of teaching. Taking the amorphous material as an example, teachers can use CAD drawing to display its detailed content, which is convenient for students to understand. It is also possible to use information technology to show the flow chart of the synthesis and preparation of various materials, which is convenient for students to operate by themselves.

In order to maximize the positive role of information technology teaching mode, teachers can also introduce popular micro-lecture teaching mode, MOOC teaching platform and flipped classroom teaching mode in the process of application, and cooperate with information technology teaching to jointly Improve teaching quality. Rain classroom can also be introduced to carry out teaching to realize the integration of students' sign-in, teaching, homework assignment and communication and discussion to stimulate students' enthusiasm for learning .

### 2.2.2 Practical teaching mode

"Synthesis and Preparation of New Materials" is very practical. In addition to mastering theoretical knowledge, students also need to have experimental operation ability in order to realize the combination of theory and practice and improve students' professional level. In the process of reforming experimental teaching, teachers need to guide students to think about the necessity of experiments and the principles and schemes of experiments, so that students can conduct experiments under the guidance of problems. It is also possible to carry out practical teaching by means of comprehensive experiments. Students use their own knowledge reserves and mastered methods to conduct experiments and choose different experimental methods. Taking the preparation of barium titanate as an example, students can use different preparation materials and methods to carry out experiments to improve the flexibility of experiments. While improving students' hands-on ability, it also improves students' innovative thinking .

## 2.3 Teaching evaluation system

In the teaching reform, the teaching evaluation system also needs to be reformed. In the usual grades, students' attendance, classroom performance and homework completion needs to be included in the teaching evaluation. And use a combination of open-book exams and closed-book exams to test students' ability to master knowledge. In the open-book examination, some practical and interdisciplinary questions can be designed for students to comprehensively examine students' professional level and knowledge application ability.

## Conclusion

Inorganic non-metallic materials engineering is receiving increasing attention at present. It is necessary to do a good job in the teaching reform of "Synthesis and Preparation of New Materials", optimize teaching content, innovate teaching mode, use information technology teaching mode, practical teaching mode and interactive teaching mode. Teaching mode to carry out teaching work. The evaluation system also needs to be reformed to improve the fairness and scientificity of the evaluation system, and drive the overall improvement of teaching quality.

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