

Siberian Federal University

Research Seminar

Course (module) Title

Research Seminar

Course (module)

Krasnoyarsk, 2020

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Course (module) Guide Research Seminar

1. Course (module) Description

1.1 Course (module) overview

The course of «Petrochemicals production processes» provided a curriculum of postgraduate program 02.00.13 Petroleum Chemistry.

The purpose of studying the discipline Research Seminar is to form research skills among the students who have a high level of theoretical knowledge in the field of petrochemistry. The course helps to learn how to discuss publicly qualifying research work in all stages of implementation. These outstanding abilities are critical for scientific and pedagogical personnel with the highest qualification degree for future activities on independent research conducting, teaching and expert consulting activities.

1.2 Special features of the course (module)

- The course acquaints with the main theoretical schools, approaches, concepts in petrochemistry.
- The course helps to determine cutting-edge research areas for the topic selection by the graduate student.
- The course creates abilities to search, analyze, understand and generalize scientific and technical information critically by graduate students, formalize the results of research work.
- The course up scales the professional level of the postgraduate students for being capable to solve the main problems of modern petrochemical sciences.
- The course forms professional skills in the organization of research work, including the goals and objectives of the research, preparation of a research program, experiments and tests, processing, analysis and publications of the results of scientific work.
- The course provides an experience in public presentation and scientific discussion.

1.3 Course (module) aim

- To provide the postgraduate student systematic knowledge with the crucial aspects of petrochemical manufacture.
- To improve abilities of scientific presentation and scientific results

publication.

- To improve and expand knowledge in organic chemistry of compounds of petroleum and refining.
- To learn to realize petrochemical synthesis methods and laboratory synthesis.

1.4 Course (module) objectives

- To arrange knowledge in general refinery and petrochemical operations, their products and economic importance.
- To promote an understanding of Individual process units covering separation, treatment and conversion of crude oil into refined hydrocarbon products.
- To examine petrochemicals extraction and refining methods, depending on their physical and chemical properties.
- To acquaint with the synthesis methods of some petrochemical products in the laboratory.

1.5 Learning outcomes of the course (module)

By the end of the course, students will be able to:

- carry out research activities independently in the relevant professional field using modern research methods, information and communication technologies;
- organize the work of a research team in the field of chemistry and related sciences.

A graduate of postgraduate course must have the following professional competencies:

- the ability to conduct independently scientific research with obtaining scientific results that meet the established requirements for the content of dissertations for the degree of sciences candidate in the scientific specialty Petrochemistry;
- the ability to realize teaching activities in the field of petrochemistry.

1.6 Teaching and Learning Methods

The course includes methodological information which will be educated by the students themselves, practice sessions and seminars session in lecture halls of «Basic chair of chemistry and technology of natural energy

resources and carbon materials»

2. Course Instructor(s) and Tutor(s), Contact Information



Sergei V. Kudryashev, Head of the program

Doctor of Chemistry in specialty 02.00.13
Petroleum Chemistry, Deputy Director for Science at
the Institute of Petroleum Chemistry, Siberian Branch
of the Russian Academy of Sciences, Professor

Research fields: plasma-chemical
transformations of hydrocarbons.

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3. Prerequisites

Background in general chemistry, organic chemistry, refining.

4. Course (module) Outline

4.1 Course (module) requirements

4.1.1. Required text(s)

Main literature

1. Petroleum Chemistry and Refining [Text]: monograph / ed. J. G. Speight. - London: Taylor & Francis, 1998. - xiv p. : ill. - (Applied Energy Technology Series / Editor: J.G. Speight). - Glossary: p. 247-262.
2. The chemistry and technology of petroleum [Text] / J. G. Speight. - 4th ed. - Boca Raton ; London ; New York : CRC Press : Taylor & Francis Group, 2006. - 919 p.
3. Applied process design for chemical and petrochemical plants [Electronic resource]. Vol. 1 / E. E. Ludwig. - 3th ed. - Electronic text data (28,8 MB). - Boston : Butterworth-Heinemann, 1999. - 630 p.
4. Applied process design for chemical and petrochemical plants [Electronic resource]. Vol. 2 / E. E. Ludwig. - 3th ed. - Electronic text data (38,3 MB). - Boston : Butterworth-Heinemann, 1999. - 486 p

5. Applied process design for chemical and petrochemical plants [Electronic resource]. Vol. 3 / E. E. Ludwig. - 3th ed. - Electronic text data (24,4 MB). - Boston : Butterworth-Heinemann, 1999. - 690 p.
6. Handbook of Vinyl Polimers. Radical Polymerization, Process and Technology [Text]: monograph / Y. Vagci; Ed. M.K. Mishra. - 2nd ed. - London: CRC Press, 2009. - 763 p.
7. Handbook of MTBE and Other Gasoline Oxygenates [Text] / ed.: H. Hamid, M. Ashraf Ali. - New York : Marcel Dekker, 2004. - 381 p.
8. Polymer Chemistry [Text]: monograph / W. R. Moore. - London: University of London Press LTD, 1967. - 270 p.
9. Petroleum Processing Handbook [Text]: monograph / ed. J. J. McKetta. - Basel; Hong Kong: Marcel Dekker, 2010. -774 p.
10. Practical Advances in Petroleum Processing [Text] / ed .: C. S. Hsu, P. R. Robinson. - Berlin: Springer, 2006 -. Volume 2. - 2006. - xv, 411 p.
11. Purification of laboratory chemicals [Electronic resource] / Wilfred L. F. Armarego, Christina L. L. Chai. - Electronic text data (20,1 MB). - Amsterdam: Butterworth-Heinemann, 2003. - 634 p. - Ver. with the title. screen. - Electron. version of the printer. publication.
12. Organic chemistry [Electronic resource] / J. Clayden. - Electronic text data (33,9 MB). - [S. l. : s. n.], 2001. - 1490 p
13. Polymers a Property Database [Text]: monograph / ed .: B. Ellis, R. Smith. - 2nd ed. - London: CRC Press, 2009. - xxii p. : tabul. - Name and Synonym index: p.1089-1106.
14. Petroleum Refining. Tehnology and Economics [Text] / J. H. Gary, G. E. Handwerk, M. J. Kaiser. - 5th ed. - Boca Raton; London: CRC Press; London; New York: Taylor & Francis Group, 2007. - 463 p.
15. Essentials of Petroleum. A Key to Oil Economics [Text]: monograph / P. H. Frankel; foreword by M. A. Adelman. - London: Frank Cass, 2005. - xiii, 188 p.
16. Petroleum Refinery Process Economics [Text]: a monograph / R. E. Maples. - 2nd ed. - Tulsa: Penn Well, 2000. - xxix, 474 p.

Additional literature

1. Hazardous Chemicals Handbook [Electronic resource] / P. Carson, C. Mumford. 2nd ed. - Electronic text data (2.41 MB). - Oxford: Butterworth-Heinemann, 2002. - 608 p.
2. Eierdanz H. Technical Reactions for Production of Oleochemical Monomers. Perspektiven Nachwachsender Rohstoffe In Der Chemie [serial online]. January 1996:107. Available from: Complementary Index, Ipswich, MA.
3. Polymers from Pristine and Modified Natural Monomers. Chemicals & Fuels

- From Bio-Based Building Blocks [serial online]. January 2016:275. Available from: Complementary Index, Ipswich, MA.
4. Jung G. Polymer Supported Organic Synthesis: A Review. Combinatorial Peptide & Nonpeptide Libraries [serial online]. January 1996:19. Available from: Complementary Index, Ipswich, MA.
 5. Speight J. Petrochemicals. Rules Of Thumb For Petroleum Engineers [serial online]. January 2017:559. Available from: Complementary Index, Ipswich, MA.
 6. le Noble W. Organic Reaction Mechanisms [e-book]. John Wiley & Sons, Inc; 2005. Available from: Gale Virtual Reference Library, Ipswich, MA.
 7. Weissermel K, Arpe H. Aromatics - Production and Conversion. Industrial Organic Chemistry [serial online]. January 1997;:311. Available from: Complementary Index, Ipswich, MA.
 8. Weissermel K, Arpe H. Benzene Derivatives. Industrial Organic Chemistry [serial online]. January 1997:335. Available from: Complementary Index, Ipswich, MA.

The list of information and telecommunication resources required for mastering the discipline (module) is available via Internet network

1. www.eLIBRARY.RU - Scientific electronic library. Access mode is free.
2. www.sciencedirect.com - Elsevier Database. Access mode is free.
3. www.nature.com - Scientific journal Nature. The access mode is free.
4. www.scopus.com - Scopus peer-reviewed literature database. Access mode is free.
5. www.springerlink.co - Springer Database.
6. www.isiknowledge.com - Web of Science Database. Access mode is free.

4.1.2 Web page of the course (module)

You can receive the information about the postgraduate program 02.00.13 Petroleum Chemistry and about the course in SibU website: www.e.sfu-kras.ru. You must be logged in to access this course. Course materials and required reading materials are available at the course web-page.

4.1.3. Course (module) materials (seminar notes, assignments for classroom activities and sessions)

Prior to attending the seminars some preparation can be very valuable. Consultation on the Research Seminar module is carried out by electronic

resources that are associated with the SFU or face-to-face. There are various materials for self-preparation, for seminars or practical classes, which are available a week before the class on the web page of the discipline provided by My SFU Resource. The materials can be in form of simple text documents while others may be audio or video files, or online exercises. Most of them are supplementary intended for independent study and are not supposed to replace the practical sessions. The great benefit is that you can return and revisit them when you want. Home assignments involve printed reports, oral or visual presentations.

4.1.4 Required feedbacks

The supervisor might use the web page of the discipline as a communication channel. It is important that you become familiar with checking and accessing it regularly. Make sure that you have access to the correct module pages, and get in touch with your lector or programmer administrators in any other cases.

4.2. Course (module) Structure

4.2.1 Internal education

Learning activities	Total credits (academic hours)	Semester	Semester
		3	4
Total	6 cr. (216 a. h.)	3 cr. (108 a. h.)	3 cr. (108 a. h.)
Lectures	-	-	-
Practice sessions / Seminars,	1,39 cr. (50 a. h.)	0,72 cr. (26 a. h.)	0,67 cr. (24 a. h.)
Self-study of the students:			
Study of the theoretical course (including preparation for final attestation)	4,61 cr. (166 a. h.)	2,28 cr. (82 a. h.)	2,33 cr. (84 a. h.)
Final Attestation	credit, credit	credit	credit

4.3 Time schedule course (module) and course (module) outline

4.3.1 Internal education

№	Topic	week, №	Learning Activities (lecture, lab, class assignments, assessment and other)	Hours	Self-study Assignments	Reading
1st Semester						
1	Analysis of current research areas on the topic of the dissertation.	1-5	Seminar 1. Goals and objectives of the thesis. Analytical review of scientific publications and patents on a given topic. Methods for finding scientific information. Critical analysis of information.	16	Exact topics for assignments are depended on the line of academics research that is conducted by the students. They must prepare not less than 3 oral/writing reports	The literature listed in 4.1 paragraph. The articles and materials are indexed by Scientific Databases listed in 4.1 paragraph.
		6-10	Seminar 2. Formulation of the thesis topic, justification of the topic relevance. Formation of the goals and objectives of the research. Preparation of a report for the scientific seminar.	7	Exact topics for assignments are depended on the line of academics research that is conducted by the students. They must prepare not less than 2 oral/writing reports	The literature listed in 4.1 paragraph. The articles and materials are indexed by Scientific Databases listed in 4.1 paragraph.
2	Drawing up of a research program and a plan of the dissertation	11-17	Seminar 3. Analytical selection of research methods, justification of the instruments and equipment that are planning to be used. Drawing up a research plan. Scientific report preparation, scientific seminars	9	Exact topics for assignments are depended on the line of academics research that is conducted by the students. They must prepare not less than 2	The literature listed in 4.1 paragraph. The articles and materials are indexed by Scientific Databases

					oral/writing reports about the equipment that are used for investigations	listed in 4.1 paragraph.
3	Final attestation	18	<u>Credit 1</u>			
2nd Semester						
4	Drawing up of a research program and a plan of the dissertation	1-5	<u>Seminar 4.</u> Analysis of the research work results. Overview of the programs that are used for experimental data processing.	5	Exact topics for assignments are depended on the line of academics research that is conducted by the students. They must prepare not less than 2 oral/writing reports about the programs that are used for experimental data processing	The literature listed in 4.1 paragraph. The articles and materials are indexed by Scientific Databases listed in 4.1 paragraph.
5	Scientific research carrying out Analysis, processing and presentation of research results.	6-10	<u>Seminar 5.</u> Structuring of materials comprise the dissertation. Basic rules for registration. Drawing up of presentations, scientific articles, reports	6	Exact topics for assignments are depended on the line of academics research that is conducted by the students. They must prepare not less than 2 oral/writing reports	The literature listed in 4.1 paragraph. The articles and materials are indexed by Scientific Databases listed in 4.1 paragraph.
		10-17	<u>Seminar 6.</u> Interpretation of the research results Preparing a report for the dissertation defense.	7	Exact topics for assignments are depended on the line of academics research that is conducted by the students. They must prepare not	The literature listed in 4.1 paragraph. The articles and materials are indexed by Scientific

					less than 2 oral/writing reports	Databases listed in 4.1 paragraph.
6	Final attestation	18	<u>Credit 2</u>			

5. Assessment

5.1 Form of assessment

Home assignment will involve some form of printed and oral reports, or downloadable file on the web page of the discipline within the specified period. The students must realize successfully not less than 6 oral reports during the course.

5.2 Grading scale

Grade policy for both home assignments and the final exam is:

- A (excellent work) 91–100 points
- B (above average work) 81–90 points
- C (average work) 71–80 points
- D (below average work) 50–70 points
- F (failed work) < 50 points

Students are assessed by results of practical laboratory work, tests, and a final exam. Progress assessment:

- 25% home assignments;
- 25% oral presentations;
- 25% writing presentation;
- 25% credits.

6. Attendance Policy

Students are expected to attend and participate in classes and should notify lecturer of excused absences in advance, where possible. Students who have an excused absence are expected to make arrangements with lecturer for alternative assignment.

Every topic has a home assignment work that should be done. The final mark will be made by the same grade policy as for a final exam.

7. Required Course (module) Participation

Students should be able to:

- defend the writing reports (50 points maximum),
- write an answer on 2 questions, demonstrate covered material (50 points maximum).

8. Facilities, Equipment and Software

The implementation of the course provides for the availability of lecture rooms (personal computers, printers, copier, projector, demonstration materials) with access to webpages of the E-learning SibFU through web site: www.sfu-kras.ru. The training process for this course uses standard Microsoft Office programs.

List of required software.

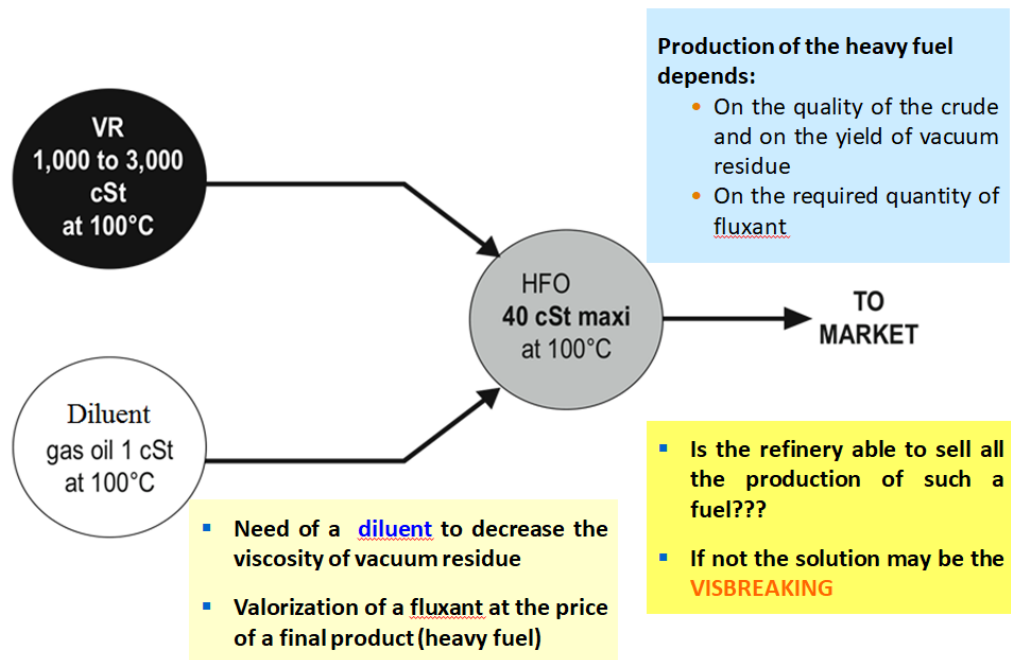
1. Windows XP or later operating system from Microsoft® Windows family.
2. Microsoft® Office Professional Plus 2010 Russian Academic OPEN No Level.
3. ESET NOD32 Antivirus Business Edition for 2750 users.
4. Adobe Acrobat Pro Extended 9.0 WIN AOO License IE Acrobat Pro Extended, License Certificate from Softline (10.12.2008, indefinitely).
5. Ascon Compass-3D, License Certificate №E-08-000123 (11.09.2008); №E-7-00107 (12.12.2017, indefinitely).
6. AutoCAD, free software.

Annex 1. Example of Questions for the Attestation

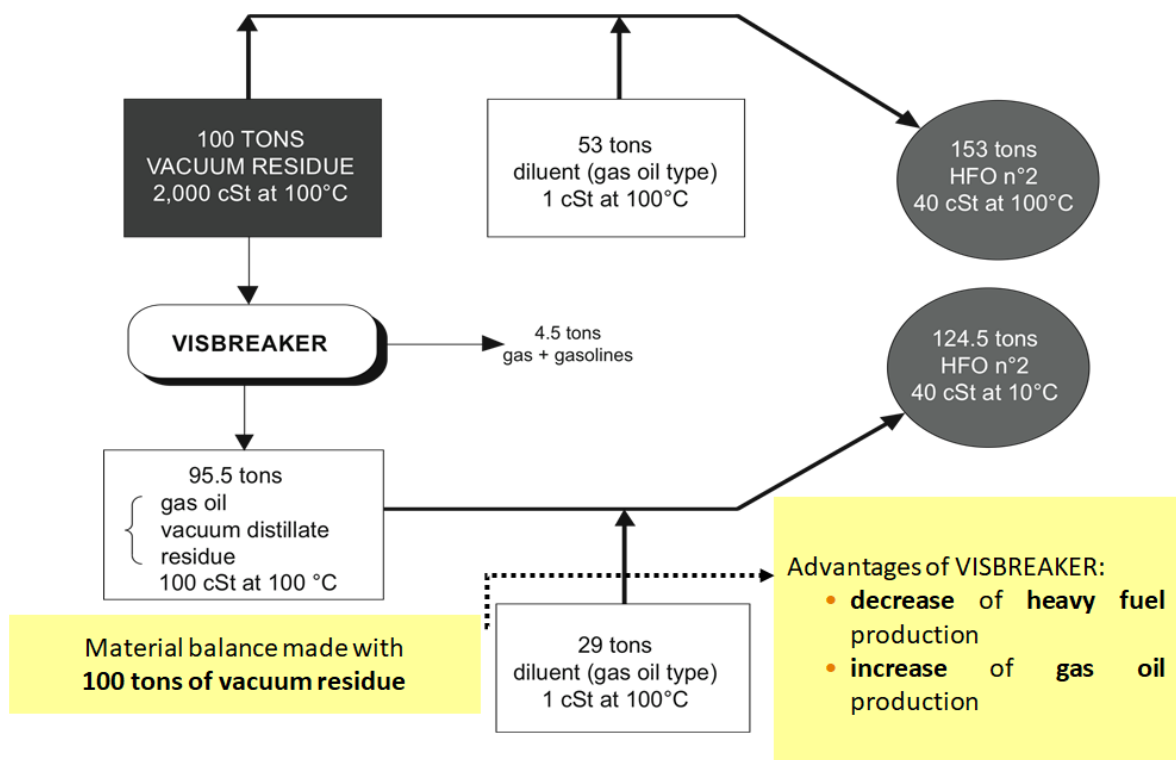
Questions for certification in the discipline "Research Seminar" are compiled individually for each student based on the topic of scientific research.

Annex 2. Example of Self-Study Assignment

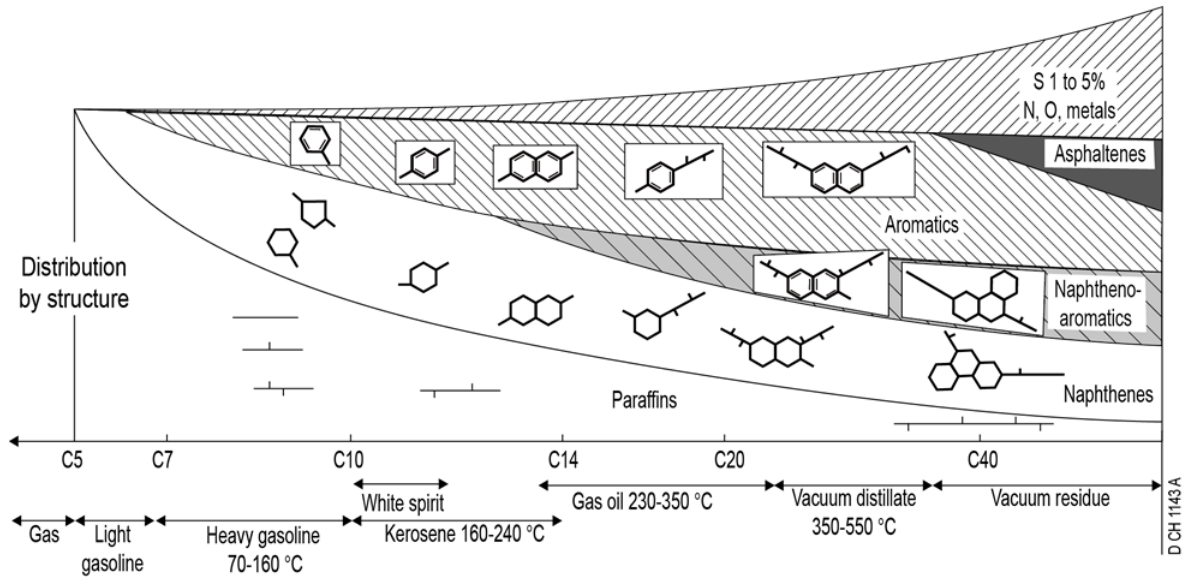
Purpose of visbreaking



Purpose of visbreaking

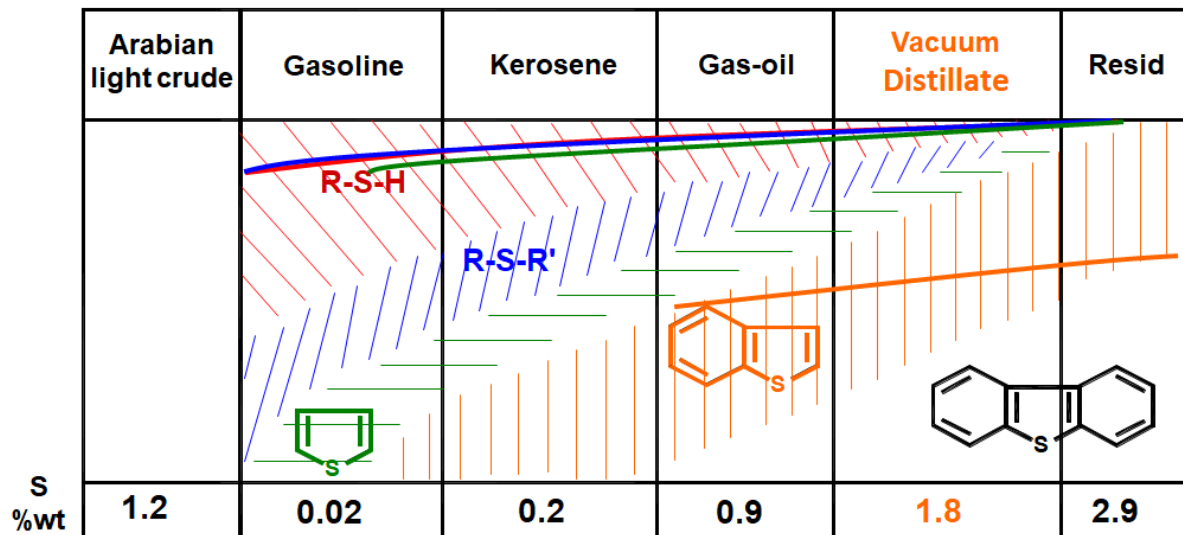


Crudes properties and comparison



Structural characteristics of petroleum fractions

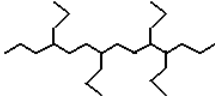
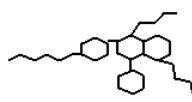
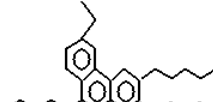
Crudes properties and comparison



Typical distribution of Sulfur Compounds

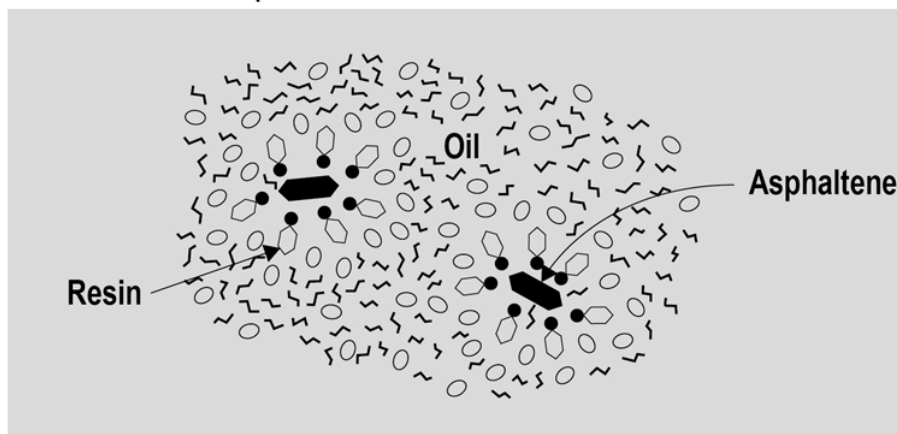
Visbreaking feedstocks

■ Some of their properties are given in the table:

	Paraffinic	Naphtenic	Aromatic
			
SPECIFIC GRAVITY	Low	Average	High
(C/H) Mass ratio	Low	Average	High
Net Calorific Value	High	Average	Low

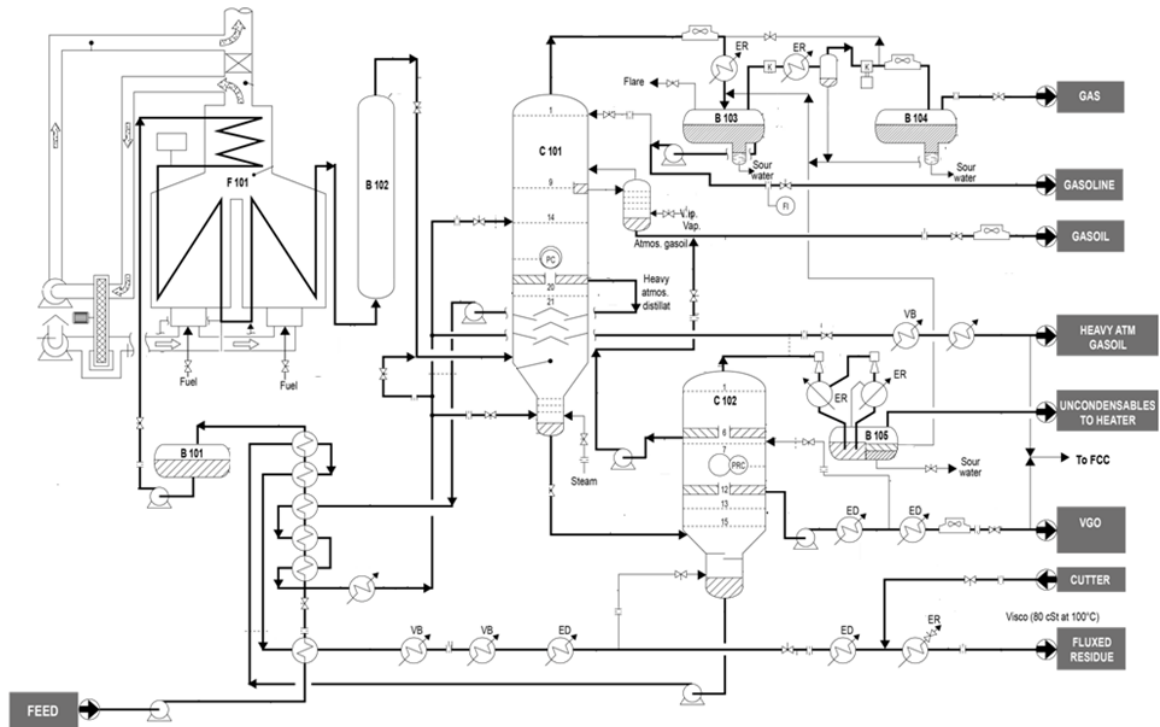
Residue structure

- Residue feed structure is a colloidal system phase with:
 - A dispersed phase: micelles made of asphaltenes and maltenes as heavy aromatics type (resins) adsorbed on asphaltenes
 - A continuous phase: made of other maltenes



D CH 141 B

Soaker visbreaker



Course Research Seminar

Basic Information

This is a course, which contributes to postgraduate educational program 04.06.01 Chemical Sciences, specialization is 02.00.13 Petroleum Chemistry.

Course period	From September 1st till May 31st, 3 and 4 semesters (30 weeks)
Study credits	6 ECTS credits
Duration	216 hours
Language of instruction	English
Academic requirements	<ul style="list-style-type: none">– M. Sc degree in Petroleum Engineering, Engineering, Chemistry , Environmental Sciences or equivalent (transcript of records),– good command of English (certificate or other official document)

Course Description

The purpose of studying the discipline Research Seminar is to form research skills among the students who have a high level of theoretical knowledge in the field of petrochemistry. The course helps to learn how to discuss publicly qualifying research work in all stages of implementation. These outstanding abilities are critical for scientific and pedagogical personnel with the highest qualification degree for future activities on independent research conducting, teaching and expert consulting activities.

Special Features of the Course

- The course acquaints with the main theoretical schools, approaches, concepts in petrochemistry.
- The course helps to determine cutting-edge research areas for the topic selection by the graduate student.

- The course creates abilities to search, analyze, understand and generalize scientific and technical information critically by graduate students, formalize the results of research work.

- The course up scales the professional level of the postgraduate students for being capable to solve the main problems of modern petrochemical sciences.

- The course forms professional skills in the organization of research work, including the goals and objectives of the research, preparation of a research program, experiments and tests, processing, analysis and publications of the results of scientific work.

- The course provides an experience in public presentation and scientific discussion.

Course Aims

- To provide the postgraduate student systematic knowledge with the crucial aspects of petrochemical manufacture.
- To improve abilities of scientific presentation and scientific results publication.
- To improve and expand knowledge in organic chemistry of compounds of petroleum and refining.
- To learn to realize petrochemical synthesis methods and laboratory synthesis.

Course Objectives

- To arrange knowledge in general refinery and petrochemical operations, their products and economic importance.
- To promote an understanding of Individual process units covering separation, treatment and conversion of crude oil into refined hydrocarbon products.
- To examine petrochemicals extraction and refining methods, depending on their physical and chemical properties.
- To acquaint with the synthesis methods of some petrochemical products in the laboratory.

Learning Outcomes of the Course

By the end of the course, students will be able to:

- carry out research activities independently in the relevant professional field using modern research methods, information and communication technologies;
- organize the work of a research team in the field of chemistry and related sciences.

A graduate of postgraduate course must have the following professional competencies:

- the ability to conduct independently scientific research with obtaining scientific results that meet the established requirements for the content of dissertations for the degree of sciences candidate in the scientific specialty Petrochemistry;
- the ability to realize teaching activities in the field of petrochemistry.

Course Outline

Week	Topic	Lections / Practice session / Assignments	Hours ¹ (Internal education)
1-7	Analysis of current research areas on the topic of the dissertation.	Seminar 1. Goals and objectives of the thesis. Analytical review of scientific publications and patents on a given topic. Methods for finding scientific information. Critical analysis of information.	16
		Seminar 2. Formulation of the thesis topic, justification of the topic relevance. Formation of the goals and objectives of the research. Preparation of a report for the scientific seminar.	7
		Self-study assignments. Exact topics for self-study assignments are depended on the line of academics research that is conducted by the students.	55.33

¹ Hours designed for Classroom sessions, Web-sessions, Home Assignments etc.

5-14	Drawing up of a research program and a plan of the dissertation	<p><u>Seminar 3.</u> Analytical selection of research methods, justification of the instruments and equipment that are planning to be used. Drawing up a research plan. Scientific report preparation, scientific seminars</p> <p><u>Self-study assignments.</u> Exact topics for self-study assignments are depended on the line of academics research that is conducted by the students.</p>	9 26.66
15	Final attestation (Credit 1)		
16-20	Drawing up of a research program and a plan of the dissertation	<p><u>Seminar 4.</u> Analysis of the research work results. Overview of the programs that are used for experimental data processing.</p> <p><u>Self-study assignments.</u> Exact topics for self-study assignments are depended on the line of academics research that is conducted by the students.</p>	5 28
21-29	Scientific research carrying out Analysis, processing and presentation of research results.	<p><u>Seminar 5.</u> Structuring of materials comprise the dissertation. Basic rules for registration. Drawing up of presentations, scientific articles, reports</p> <p><u>Self-study assignments.</u> Exact topics for self-study assignments are depended on the line of academics research that is conducted by the students.</p>	6 28
		<p><u>Seminar 6.</u> Interpretation of the research results Preparing a report for the dissertation defense.</p> <p><u>Self-study assignments.</u> Exact topics for self-study assignments are depended on the line of academics research that is conducted by the students.</p>	7 28
30	Final attestation (Credit 2)		

Lecturer and Contact Information

Sergei V. Kudryashev, Head of the program



Doctor of Chemistry in specialty 02.00.13 Petroleum Chemistry, Deputy Director for Science at the Institute of Petroleum Chemistry, Siberian Branch of the Russian Academy of Sciences, Professor

Research fields: plasma-chemical transformations of hydrocarbons.

Address: (room 313) 82/6, Svobodny prospect, Krasnoyarsk.

E-mail: fburyukin@sfu-kras.ru

Assessment

Grade policy for both home assignments and the final exam is:

- A (excellent work) 91–100 points
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Web page of the course

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Core reading

1. Hazardous Chemicals Handbook [Electronic resource] / P. Carson, C. Mumford. 2nd ed. - Electronic text data (2.41 MB). - Oxford: Butterworth-Heinemann, 2002. - 608 p.
2. Eierdanz H. Technical Reactions for Production of Oleochemical Monomers. Perspektiven Nachwachsender Rohstoffe In Der Chemie [serial online]. January 1996:107. Available from: Complementary Index, Ipswich, MA.
3. Polymers from Pristine and Modified Natural Monomers. Chemicals & Fuels From Bio-Based Building Blocks [serial online]. January 2016:275. Available from: Complementary Index, Ipswich, MA.
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