PETROLEUM GEOLOGY

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Research Interests: Complex interpretation of geological and geophysical data and assessing the oil and gas potential in Western and Eastern Siberia.

Course Goal

To acquaint students with theoretical knowledge on the basics of geology and geochemistry of combustible resources, primarily oil and gas.

Course Outline

Oil and Gas Deposits: The concept of oil, natural gas, and other naftides. The main types of combustible minerals (caustobioliths): coals, peat, sapropel, oil, asphalt, ozocerite. Unconventional oil. Types of accumulations and deposits by the phase hydrocarbons composition. The relationship of oil, gas, and water in deposits. Classification of deposits by the structure of traps. The main characteristics of the deposit. Temperature and pressure in oil and gas deposits. Geotectonic, structural, stratigraphic distribution of oil and gas fields. Features of deposits of platform and geosynclinal provinces.

Oil Geological Structures: Sedimentary basins. Types of rocks. Lithogenesis. Concepts of collectors, reservoirs, insulating covers, traps. Oil and gas bearing complexes (reservoirs), their classification. Porosity and permeability of reservoirs. Primary and secondary pores. Types of oil and gas collectors: granular, fractured-cavernous, fractured. Oil, gas and water in the pore space of the reservoir. Coefficients of oil saturation and residual water saturation. Changes in reservoir properties with depth.

Oil Formation: The origin of oil and gas. Theory of the organic origin of oil and gas and the formation of their deposits. Theory of inorganic origin of oil. Conditions for formation of oil and gas accumulations in the earth's crust. Hydrogeological conditions of oil and gas fields. Processes of migration and accumulation of oil and gas. Classification of oil and gas migration

processes: primary, secondary, lateral migration in the formation and destruction of deposits. The principle of differential capture.

Geochemistry of Oil and Gas: Physicochemical characteristics of oil: density, viscosity, gas content, sulfur content, surface tension, heat of combustion, optical activity. Group composition of oil. The main types of hydrocarbon compounds in oils and natural gases. Non-hydrocarbon components of oil. Elemental composition of oil. Isotopic composition of carbon of oil and gas. Composition and genetic types of natural gases. Dissolved gas, gas caps and free gas. Gas hydrates.

Oil Exploration: Phases and stages of oil exploration. Oil and gas geological zoning. Quantitative assessment of oil and gas potential. Reserves and resources. Theoretical foundations and main provisions of the methodology for prospecting and exploration of oil and gas fields. Main groups of exploration methods: geological, geochemical, geophysical. Types and methods of surveys on land and in sea. Seismic surveys.