

勘探地球物理学

青藏高原多年冻土区天然气水合物形成条件模拟研究

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摘要 基于野外气体地球化学调查研究, 以及前人有关冻土表层温度、冻土层内地温梯度、冻土层下地温梯度等的资料, 对青藏高原多年冻土区天然气水合物的形成条件开展了模拟研究. 结果显示: 研究区冻土条件能够满足天然气水合物形成的基本要求; 气体组成、冻土特征 (如冻土厚度或冻土表层温度、冻土层内地温梯度、冻土层下地温梯度等) 是影响研究区天然气水合物稳定带厚度的最重要因素, 其在不同点位上的差异性可能导致天然气水合物分布的不均匀性的主要原因; 研究区最可能的天然气水合物为甲烷与重烃 (乙烷和丙烷) 的混合气体型天然气水合物; 在天然气水合物分布的区域, 其产出的上临界点深度在几十至一百多米间, 下临界点深度在几百至近一公里间, 厚度可达到几百米. 与Canadian Mallik三角洲多年冻土区相比, 青藏高原多年冻土区除了冻土厚度小些外, 其他条件, 如冻土层内地温梯度、冻土层下地温梯度、气体组成等条件较为相近, 具有一定的可比性, 预示着良好的天然气水合物潜力.

关键词 [多年冻土](#) [天然气水合物](#) [形成条件](#) [模拟](#) [青藏高原](#)

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Modeling on gas hydrate formation conditions in the Qinghai-Tibet plateau permafrost

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Abstract Based on field-investigated gas geochemistry and predecessors' data such as the permafrost ground temperature, thermal gradients within/below the frozen layer, the modeling on gas hydrate formation conditions is conducted in the Qinghai-Tibet plateau permafrost. The modeled results show that the permafrost characteristics generally meet gas hydrate formation conditions in the study area. Gas composition, temperature-related permafrost parameters (e.g. permafrost thickness or its ground temperature and thermal gradients within / below the frozen layer) are the most important factors affecting gas hydrate occurrences, whose variance may cause the heterogeneity of gas hydrate occurrences in the study area. The most probable gas hydrate is the kind of hybrid of methane and weight hydrocarbon gases (ethane and propane). In the predicted gas hydrate locations, the upper gas hydrate occurrence depth may be around several ten to more than one hundred meters and the lower depth may range from several hundred meters to about one thousand meters and the thickness may reach several hundred meters. Compared with Canadian Mallik permafrost, the Qinghai-Tibet plateau permafrost has similar thermal gradients within / below the frozen layer and gas composition, except for relatively thinner permafrost, still suggesting great gas hydrate potentials.

Key words [Permafrost](#); [Gas hydrate](#); [Formation conditions](#); [Modeling](#); [Qinghai-Tibet plateau](#)

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