

Archaeal functional genes: A potential microbial prospecting technique of deep-sea methane hydrate reservoirs

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Methane hydrates, also known as gas hydrates or fire ices, represent an immense reservoir of an important future source of hydrocarbon fuel buried in the deep-sea sedimentary environments of the continental margins. The worldwide amount of carbon contained in methane hydrates may be twice of the amount of carbon found in all known fossil fuels on Earth. Methane hydrates form at low temperature and high pressure condition in the deep cold sedimentary environments of the deep sea, with methane itself predominantly produced by specific methanogenic archaea. In some regions, such as Gulf of Mexico, methane in gas hydrates may also be produced, at least partially, from thermal degradation of organic matter. "Bottom simulating reflector" (BSR), a seismic reflection at the sediment to gas hydrate stability zone interface caused by the unequal densities of normal sediments and those laced with gas hydrates, is the key to investigate the distribution of methane hydrate in deep-sea sediments. However, this detection technique may fail occasionally. Methane hydrates usually produce a unique phenomenon known as "cold seep" in the deep-sea environments due to the seeping of methane from gas hydrates. Deep-sea methane-charged environments usually sustain a significant chemosynthetic biomass production and microbiota. Decades of geochemical and microbial investigations have shed light on the carbon and sulfur cycling in these unique ecosystems. Recent research progresses also highlight the importance of microbial nitrogen cycling in the cold seep ecosystems. Certain archaeal functional genes may be unique to these methane-charged deep-sea environments, potentially useful for methane hydrate detection.

Biography

Hongyue Dang earned his Ph.D. from University of South Carolina in 2001 and received his postdoctoral trainings afterwards in State University of New York. He is currently a full professor and the executive deputy director of the Key Laboratory of Bioengineering and Biotechnology in Universities of Shandong Province. He is a council member of the China Energy Society and the China Energy Environment Technology Association as well. He has published more than 50 research papers in reputed journals and serving as editorial board members for several reputed international journals, including the *Journal of Petroleum & Environmental Biotechnology*.

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