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The influence of temperature and pressure on surface tension and bubble diameter of methane (CH₄) and carbon dioxide (CO₂) in water

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Surface tension is very important property in petroleum and gas operations. It provides an insight into understanding most of multiphase fluids behavior. In this experimental study, the surface tension of methane and carbon dioxide bubbles in a confined system due to the variation of pressure and temperature has been investigated. The surface tension was studied within a pressure range of (10–110) psig. The surface tension of the gases was measured each at 25°C, 30°C, 35°C and 40°C within the varied pressure to establish the significance of temperature. The results showed that increasing pressure at a given temperature reduces surface tension. Also increasing temperature at a given pressure reduces the surface tension. The surface tension obtained at 25°C and 10 psig is 74.85 mN/m while that of 40°C and 110 psig is 59.55 mN/m for methane bubble. The results obtained for carbon dioxide bubble at 25°C and 10 psig is 73.09 and 58.78 mN/m for 40°C and 110 psig. The diameter of the gas bubbles was also measured as a function of time at each corresponding temperature. The diameter of the carbon dioxide bubble was found to be decreasing with time, and this shows the miscibility behaviour of the CO₂ in water. In the case of CH₄, the diameter was found to remain constant in the same condition of temperature and pressure used in investigating CO₂. The results show that, though both CO₂ and CH₄ are nonpolar molecules, at the same condition of pressure and temperature CO₂ has higher dispersion than methane.

Biography

Aminu A Yahaya is a Research Student with interest in understanding natural gas hydrate formation more especially in the surface interaction during the formation processes. Her open and contextual evaluation model based on responsive constructivists creates new pathways for improving healthcare. She has built this model after years of experience in research, evaluation, teaching and administration both in hospital and education institutions. The foundation is based on fourth generation evaluation (Guba & Lincoln, 1989) which is a methodology that utilizes the previous generations of evaluation: Measurement, description and judgment. It allows for value-pluralism. This approach is responsive to all stakeholders and has a different way of focusing.

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