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Foaming in gas sweetening process: Comprehensive experimental investigations lead to better understanding and prediction of Amine foaming

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Comprehensive experimental work has been carried out to investigate the foaming behavior of aqueous Methyl di ethanolamine (MDEA) in presence of twenty different contaminates including degradation products i.e. N,N,N-tris-(hydroxyethyl) ethylenediamine (THEED), hydroxyethyl ethylenediamine (HEED), N,N/-bis-(hydroxyethyl) piperazine (bHEP), N,N-bis-(2-hydroxyethyl) glycine (bicine), organic acids,and liquid organics. This foaming study was combined with physical characterization of the tested solution to enhance the understanding of the foaming behavior. The foaming tendency of aqueous MDEA solution was reported in terms of foam volume. Foam stability was reported on the basis of the time required for the last bubble to break. The results of this study showed that each contaminate has influenced the foaming behavior either by changing the foam volume or breaking time or both. However, it has been noticed that whatever is the added contaminates to the amine solution it drags the physical properties of the amine to a point where the foaming behavior will be changed. For example, in case of THEED and HEED, the addition of these degradation products increased the foam tendency and stability of the solution as a result of increasing solution viscosity; higher bulk viscosity retards the foam collapse caused by gravity drainage. It is believed that the bottleneck of predicating the foam behavior of any solution would be the predication and monitoring of its physical properties behavior and interaction. We are working now to develop the understating of the interaction between the physical properties and their combined effect on the foaming behavior of the amine solution; this will lead to a breakthrough in foaming monitoring and prediction. Mathematical model on tendencyand stability of foaming ispresented in this paper to explain the effect of physical properties on foam volume and breaking time of aqueous MDEA solutions.

Keywords: Gas sweetening, foaming, foam stability and break time, amine degradation, amine physical properties

Biography:

Dr. Emad Alhseinat is currently a Research and Teaching Associate in the Chemical Engineering Department at the Petroleum Institute (PI) in Abu Dhabi.

Dr. Alhseinat has been working in Abu Dhabi Petroleum Institute as Research and Teaching Associate since 1st September 2013. During this period, he has been heavily involved in research activity, writing and preparing scientific proposals and presentations and publishing scientific articles. He has managed to publish one book chapter and several scientific journal papers addressing the foaming problem in natural gas sweetening units, a thermodynamic description of acid gas solubility in amine solution and the thermophysical properties characterization of gas sweetening amine solutions. Dr. Alhseinat came from the University of Edinburgh. Dr. Alhseinat is actively involved in oil and gas produced water treatment. He published a number of articles from his research in scientific journals in the field of membrane science and desalination. He also presented his work in various international conferences. He is expert in membrane fouling experiments and modelling.