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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 methyldiethanolamine (MDEA) in presence of 20 different contaminates including degradation products i.e., N,N,N-tris-(hydroxyethyl) ethylenediamine (THEED), hydroxyethylethylenediamine (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 tendency and stability of foaming is presented in this paper to explain the effect of physical properties on foam volume and breaking time of aqueous MDEA solutions.

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