

Analysis and Correlation of Dew Points in Chemical Process Technology

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Prediction of the dew points of mixtures is very important in many areas of chemical process technology. In a gas-condensate reservoir, liquid may condense and a portion of condensate remains in the reservoir, hence it is necessary to understand the dew-point behavior of the original fluid. In the transmission of natural gas, condensation of water increases pressure drop in the line and often leads to corrosion problems. In multiple-stage compression, interstage cooling often results in the condensation of low-volatile compounds. Dew-point prediction is especially important for process streams containing acidic and basic species since the liquids that may condense are usually quite corrosive. Accurate prediction of dew points is usually a challenging problem. For hydrocarbon processes, the pressures of interest are high and retrograde phenomena may occur. The condensed phase may be dominated by water, which forms highly nonideal solutions. Finally, for vapors containing water and volatile electrolytes, the correlation has a valid electrolyte model for the aqueous condensed phase. Systems of the latter type are encountered in sulfuric-acid plants and processes that treat sour gases (e.g., those containing carbon dioxide, hydrogen sulfide and ammonia). This paper analyzes data and correlation methods for various chemical process technologies where dew-point predictions are important. Correlation methods based upon cubic equations of state are generally adequate for hydrocarbon streams, including those containing water, but the vapor pressures of the condensed species must be modeled accurately and asymmetric mixing rules are required for systems containing water. For systems containing volatile electrolytes, the Electrolyte NRTL model has been employed. The dew-point data of these systems can be accurately correlated, but extrapolation should be done cautiously.