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**A Unified Approach to Sickle Hemoglobin Gelation and Phase Separation** F.A. FERRONE, Drexel University, M.U. PALMA, M.B. PALMA-VITTORELLI, University of Palermo — Protein aggregation has been identified as a major component in a number of diseases of which the earliest known and most thoroughly studied is sickle cell disease. Because of its direct bearing on pathophysiology, HbS polymer formation has been extensively described. The principal challenge now lies in the need of reconciling well documented but apparently contrasting properties of HbS solutions. These are the purely hard-sphere behavior of HbS under non-gelling conditions (extending to the 7th order in virial coefficients), and the equally well documented existence of a region of liquid-liquid demixing of the solution, from which notable deviations from hard-sphere behavior would be expected. We present a strategy to circumvent this impasse by including explicit and well known activity coefficients in a Flory-Huggins like term in the monomer chemical potential. This preserves the successful thermodynamic treatment of polymer formation while introducing a term leading to a spinodal. The formulation is consistent with known data, and implications for kinetics will be described.

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