# Thermodynamics of Sulfanilamide Solubility
# in Propylene Glycol + Water Mixtures

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*SUMMARY*. The solubility of sulfanilamide (SA) in propylene glycol + water cosolvent mixtures was determined at temperatures from 293.15 to 313.15 K. The thermodynamic functions: Gibbs energy, enthalpy, and entropy of solution and mixing were obtained from these solubility data by using the van't Hoff and Gibbs equations. The solubility was maximal in propylene glycol and very low in water at all the temperatures. A non linear enthalpy–entropy relationship was observed from a plot of enthalpy *vs.* Gibbs energy of solution. The maximum point in plot of $\Delta_{soln}H°$ *vs.* $\Delta_{soln}G°$ (0.20 mass fraction of propylene glycol) separates two different trends, one with negative slope from water up to 0.20 mass fraction of propylene glycol and the other one positive beyond this composition up to propylene glycol. Accordingly, the driving mechanism for SA solubility in water-rich mixtures is the entropy, probably due to water-structure loss around the drug non-polar moieties by propylene glycol, whereas, above 0.20 mass fraction of propylene glycol the driving mechanism is the enthalpy, probably due to SA solvation increase by the co-solvent molecules.