EXPERIMENTAL STUDIES OF SOLUBILITY OF ELEMENTAL SULPHUR IN SUPERCRITICAL CARBON DIOXIDE BETWEEN 10 AND 40 MPA

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Elemental Sulphur deposition is a problem troubling the production and the transport of natural gas. The most common location for this deposition is immediately downstream of a point of pressure reduction. A necessary step to eliminate this deposition is to understand the deposit mechanism. Recently Cézac et al.[1,2] model solubility of solid sulphur in natural gas and study the mechanisms of solid sulphur deposition. The constitutive equations of the model are classically the chemical and physical equilibriums, partial mass balances and energy balance. The Peng Robinson equation of state coupled with the van der Waals one fluid mixing rules is chosen to describe the phase behaviour. It appears that desublimation is the most likely sulphur deposition mechanism. During gas expansion, the pressure and the temperature both decrease. Consequently, the gas may become over saturated in sulphur. Also it appears that experimental data of solid sulphur solubility, even in binary, are very sparse. In this paper, the solubility data of elemental sulphur in CO2, one the three major components of natural gas, were measured between 10 and 40 MPa. A stainless still stirring equilibrium cell with a piston is the key part of the apparatus, where solid sulphur and gas phase contacted and established solid – gas equilibrium (Figure 1). Cell has a maximum working space of 500 cm3 and a maximum working pressure of 50 MPa. The amount of sulphur is obtained by CPG.

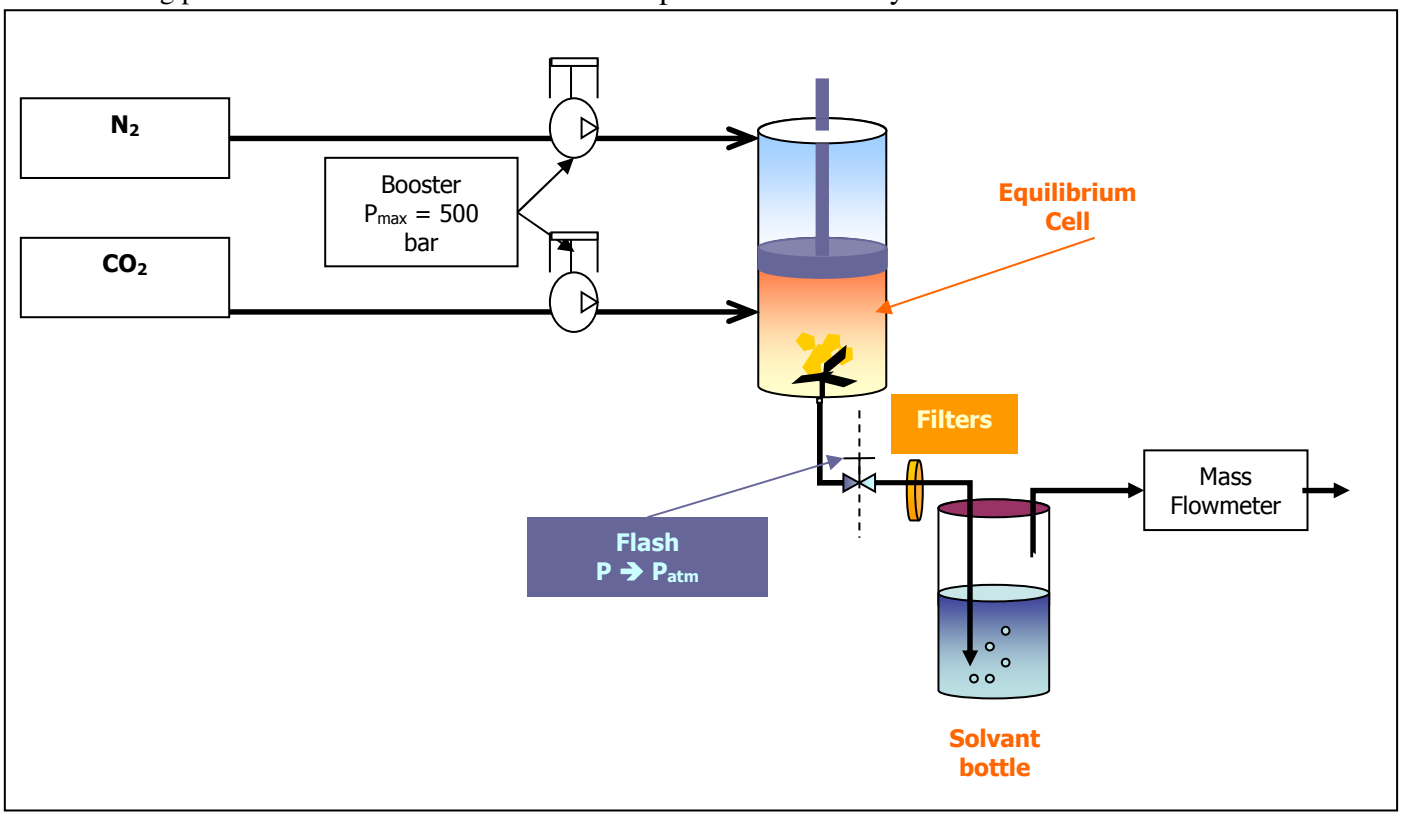

Figure 1: Apparatus for measurement of solubility of sulphur in gas

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[1] Pierre Cézac, Jean-Paul Serin, Jacques Mercadier, Gérard Mouton, Chem.Eng. J., 2007, 133, 1-3, 283-291.
[2] Pierre Cézac, Jean-Paul Serin, Jean-Michel Reneaume, Jacques Mercadier, Gérard Mouton, accepted in JSF