



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

S. Jay, Pierre Cézac, Jean-Paul Serin, Jean-Michel Reneaume, Jacques
Mercadier, Cédric Arrabie, J M Legros-Adrian

► To cite this version:

S. Jay, Pierre Cézac, Jean-Paul Serin, Jean-Michel Reneaume, Jacques Mercadier, et al.. EXPERIMENTAL STUDIES OF SOLUBILITY OF ELEMENTAL SULPHUR IN SUPERCRITICAL CARBON DIOXIDE BETWEEN 10 AND 40 MPA. 11th European Meeting on Supercritical Fluids New perspectives in supercritical fluids : Nanoscience, Materials and Processing (11th EMSF), May 2008, Barcelone, Spain. hal-02170043

HAL Id: hal-02170043

<https://univ-pau.hal.science/hal-02170043>

Submitted on 1 Jul 2019

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

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

S. Jay⁽¹⁾, P. Cézac^{*(1)}, J.P. Serin⁽¹⁾, J. M. Reneaume⁽¹⁾, J. Mercadier⁽¹⁾,
C. Arrabie⁽²⁾, J.M. Legros-Adrian⁽²⁾

⁽¹⁾High Pressure Processes Group –Dep. Chemical Engineering, Laboratoire de Thermique, Energétique et Procédés (LaTEP), Université de Pau, rue Jules Ferry, BP 7511 Pau Cedex, FRANCE.

⁽²⁾Ecole Nationale Supérieure en Génie des Technologies Industrielles (ENSGTI),
rue Jules Ferry, BP 7511 Pau Cedex, FRANCE.

Phone: 33 559407830, pierre.cezac@univ-pau.fr

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.

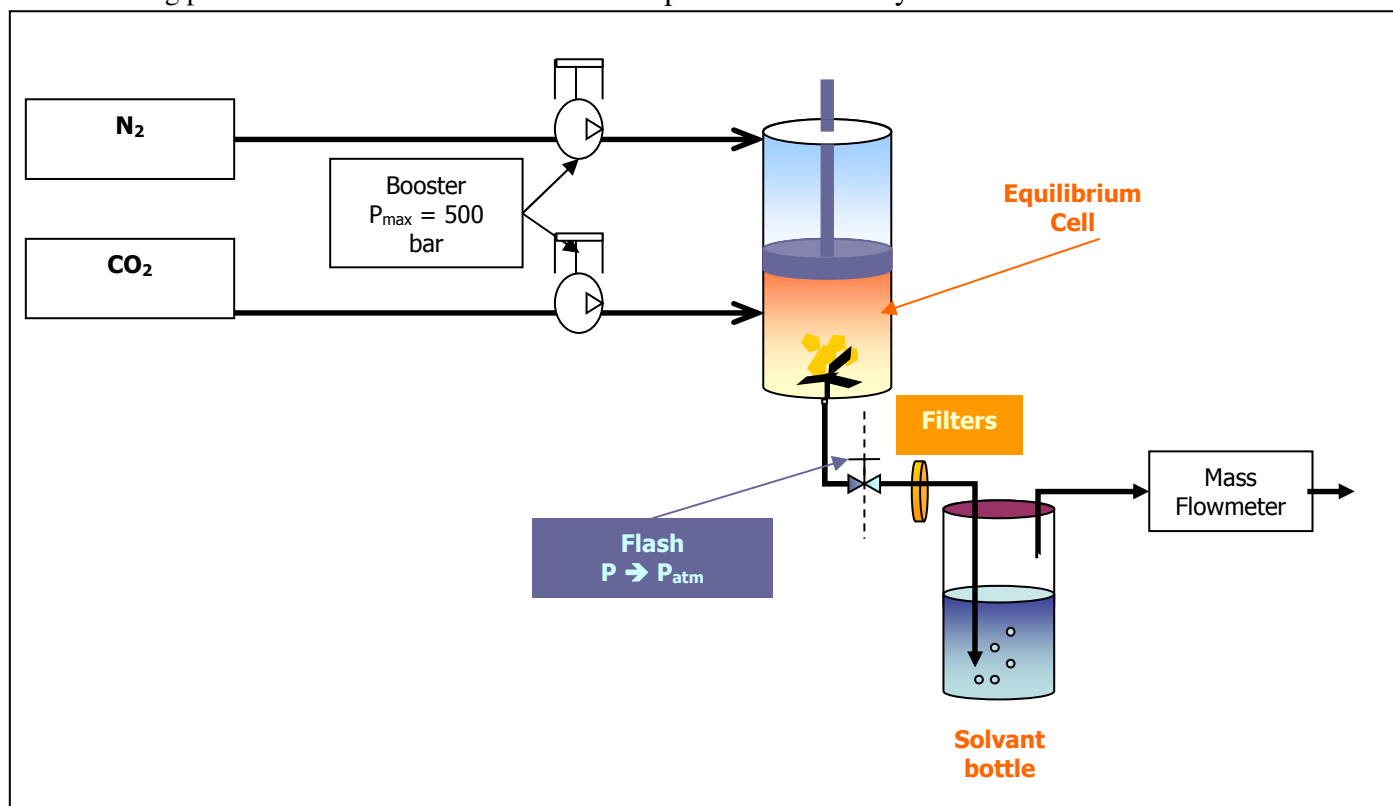


Figure 1: Apparatus for measurement of solubility of sulphur in gas

ACKNOWLEDGEMENTS

We wish to thank the Conseil Régional d'Aquitaine for his financial support to this work.

LaTEP is a member of the PILA network: High research and technological resources in multi-disciplinary actions (<http://web.univ-pau.fr/scf-PILA>)

[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