

Accepted Manuscript

Density measurements of liquefied natural gas (LNG) over the temperature range from (105 to 135) K at pressures up to 8.9 MPa

Rafael Lentner, Markus Richter, Reiner Kleinrahm, Roland Span

PII: S0021-9614(17)30107-6
DOI: <http://dx.doi.org/10.1016/j.jct.2017.04.002>
Reference: YJCHT 5036

To appear in: *J. Chem. Thermodynamics*

Received Date: 19 January 2017
Revised Date: 18 March 2017
Accepted Date: 4 April 2017

Please cite this article as: R. Lentner, M. Richter, R. Kleinrahm, R. Span, Density measurements of liquefied natural gas (LNG) over the temperature range from (105 to 135) K at pressures up to 8.9 MPa, *J. Chem. Thermodynamics* (2017), doi: <http://dx.doi.org/10.1016/j.jct.2017.04.002>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



**Density measurements of liquefied natural gas (LNG) over the temperature range from
(105 to 135) K at pressures up to 8.9 MPa**

Rafael Lentner, Markus Richter¹, Reiner Kleinrahm, Roland Span

Lehrstuhl für Thermodynamik, Ruhr-Universität Bochum, D-44780 Bochum, Germany

Manuscript prepared for publication in *J. Chem. Thermodyn.* (2016).

ABSTRACT

The (p, ρ, T, x) behaviour of five different synthetic liquefied natural gas (LNG) mixtures was investigated over the temperature range from (105 to 135) K at pressures up to 8.9 MPa utilizing a single-sinker magnetic suspension densimeter for cryogenic liquid mixtures. Due to the supercritical liquefaction procedure and the integration of a special VLE-cell, it was possible to measure densities in the homogeneous liquid phase of LNG without changing the composition. The mixtures were prepared gravimetrically and then analysed by gas chromatography according to highest metrological standards. The relative combined expanded uncertainty ($k = 2$) in density considering all effects, including the uncertainty in composition, was approximately 0.044% for all measurements. Comparisons of the new experimental data to the GERG-2008 equation of state for natural gas mixtures revealed clear and systematic deviations up to 0.22%. The reported uncertainty for the GERG-2008 equation is (0.1 to 0.5)% for the conditions considered, thus, all measured densities are represented well within this uncertainty range. Comparisons to density calculation methods often used in LNG industry, such as the Revised Klosek and McKinley method as well as the COSTALD

¹ Corresponding author. Tel.: +49-234-32-26395, E-mail: m.richter@thermo.rub.de.

Download English Version:

<https://daneshyari.com/en/article/4769502>

Download Persian Version:

<https://daneshyari.com/article/4769502>

[Daneshyari.com](https://daneshyari.com)