



Contribution ID: 181

Type: **Talk**

## Polymorphic phase transition in liquid and supercritical carbon dioxide

*Thursday, 10 December 2020 16:45 (15 minutes)*

Thermal density fluctuations of supercritical (SC) CO<sub>2</sub> were explored using small-angle neutron scattering (SANS) whose amplitude (susceptibility) and correlation length show the expected maximum at the Widom line. The susceptibility is in excellent agreement with the evaluated values on basis of mass density measurements. A surprising observation is droplet formation above the gas-liquid line and between 20 and 60 bar above the Widom line, the corresponding borderline identified as the Frenkel line. The droplets start to form spheres of constant radius of about 45 Å and transform into rods and globules at higher pressure. The droplet formation represents a liquid-liquid (polymorphic) phase transition of same composition but different number density, whose difference defines its order parameter. Polymorphism in CO<sub>2</sub> is a new phenomena, it characterizes the gas-like to liquid-like transition in SC fluids and might be of particular interest for better understanding polymorphism, since CO<sub>2</sub> represents a “simple” van der Waals liquid in contrast to water, which is the most widely studied liquid showing polymorphism in its supercooled state.

This work has been published in:

Phys. Rev. Lett. 120 (2018) 145701.

Scientific Reports (2020) 10:11861. doi.org/10.1038/s41598-020-68451-y.

**Primary authors:** Dr PIPICH, Vitaliy (Forschungszentrum Jülich GmbH, Jülich Centre for Neutron Science (JCNS) at Heinz Maier-Leibnitz Zentrum (MLZ)); Dr SCHWAHN, Dietmar (Heinz Maier-Leibnitz Zentrum (MLZ), Technische Universität München,)

**Presenter:** Dr PIPICH, Vitaliy (Forschungszentrum Jülich GmbH, Jülich Centre for Neutron Science (JCNS) at Heinz Maier-Leibnitz Zentrum (MLZ))

**Session Classification:** DN2020: Materials

**Track Classification:** DN: Materials