



	Experiment title: Amorphization of filled cage-like nanostructured materials	Experiment number: HS-2939
Beamline:	Date of experiment: from: 14 December 2005 to 16 December 2005	Date of report: 30/08/2007
Shifts:	Local contact(s): Monica AMBOAGE	<i>Received at ESRF:</i>
Names and affiliations of applicants: - ,Prof. Alfonso SAN MIGUEL Laboratoire de Physique de la Matière Condensée et Nanostructures Université Lyon 1 and CNRS, France		

Report:

High pressure x-ray diffraction experiments on several silicon host based clathrate crystals under pressure were performed at the ID09A beamline.

Some of the initial results have been included in a review article (see later) and an independent publication on the Rb₆Si₄₆ silicon clathrate is about to being submitted.

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High-pressure properties of group IV clathrates

ALFONSO SAN-MIGUEL* and PIERRE TOULEMONDE

Laboratoire de Physique de la Matière Condensée et Nanostructures, Université Claude Bernard
Lyon-1 and CNRS, 43 Bvd. du 11 Novembre 1918, 69622 Villeurbanne, France

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We review the investigations on clathrate materials having C, Si, Ge or Sn framework atoms in which the pressure parameter plays an important role. In this article, we studied the synthesis of clathrates, superconducting properties and those studies relative to the structural cohesivity and phase diagrams. We have tried to extensively review these subjects. Key references on other important properties of the group IV clathrates are provided in the introductory sections. As a main result of this review, we note that pressure appears as a key parameter for the elaboration of present and future clathrates in particular those exhibiting superconducting properties. We show how high-pressure research has also played an important role in the understanding of the parameters governing clathrate superconductivity. In contrast, the study of the structural evolution of group IV clathrates (bulk modulus and stability) gives abundant clues for tailoring new materials with improved mechanical properties. Finally, practically all investigations converge to point out that today hypothetical carbon clathrates are candidates for extraordinary superconducting and mechanical properties.