
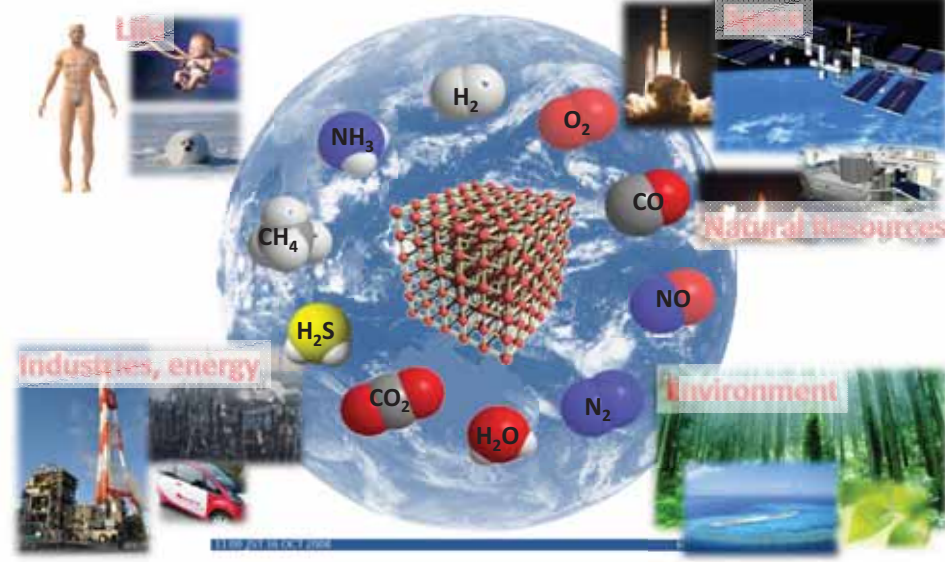



Gas science & technology

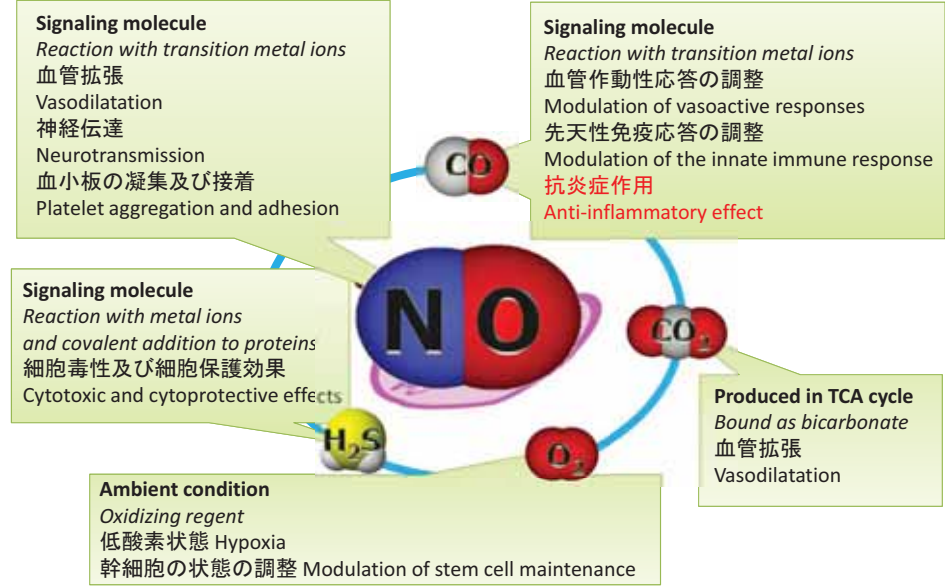




Institute for Integrated Cell-Material Sciences (iCeMS), Kyoto University

Gases in biology





Signaling molecule
Reaction with transition metal ions
 血管拡張
 Vasodilatation
 神経伝達
 Neurotransmission
 血小板の凝集及び接着
 Platelet aggregation and adhesion

Signaling molecule
Reaction with transition metal ions
 血管作動性応答の調整
 Modulation of vasoactive responses
 先天性免疫応答の調整
 Modulation of the innate immune response
 抗炎症作用
 Anti-inflammatory effect

Signaling molecule
Reaction with metal ions and covalent addition to proteins
 細胞毒性及び細胞保護効果
 Cytotoxic and cytoprotective effects

Produced in TCA cycle
Bound as bicarbonate
 血管拡張
 Vasodilatation

Ambient condition
Oxidizing reagent
 低酸素状態 Hypoxia
 幹細胞の状態の調整 Modulation of stem cell maintenance

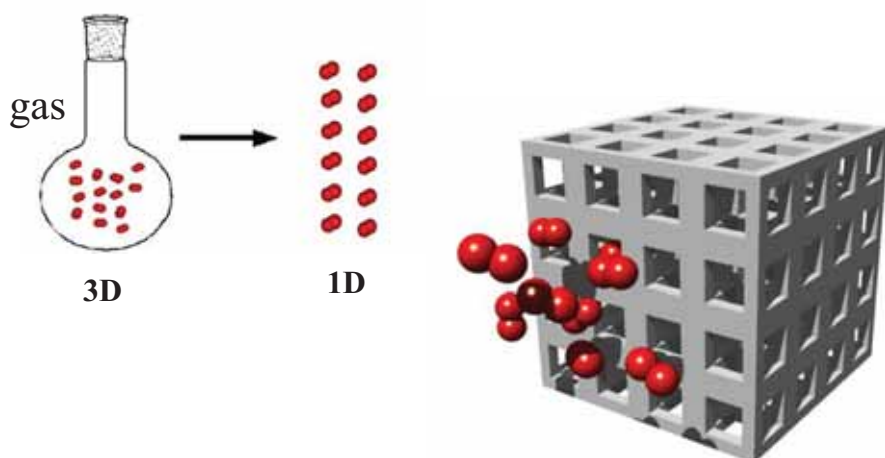
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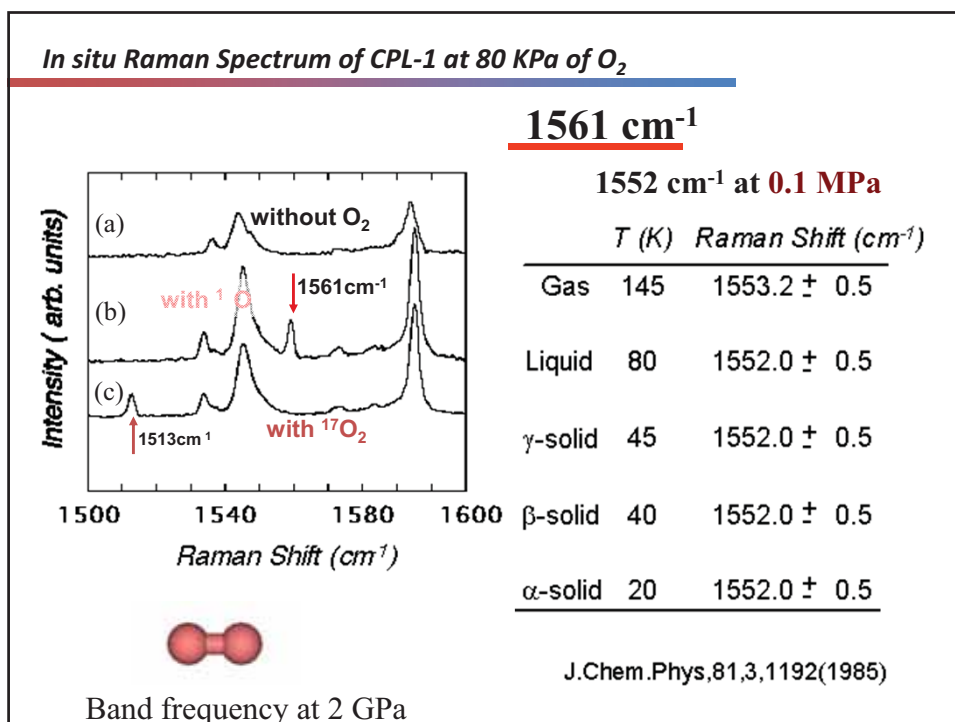
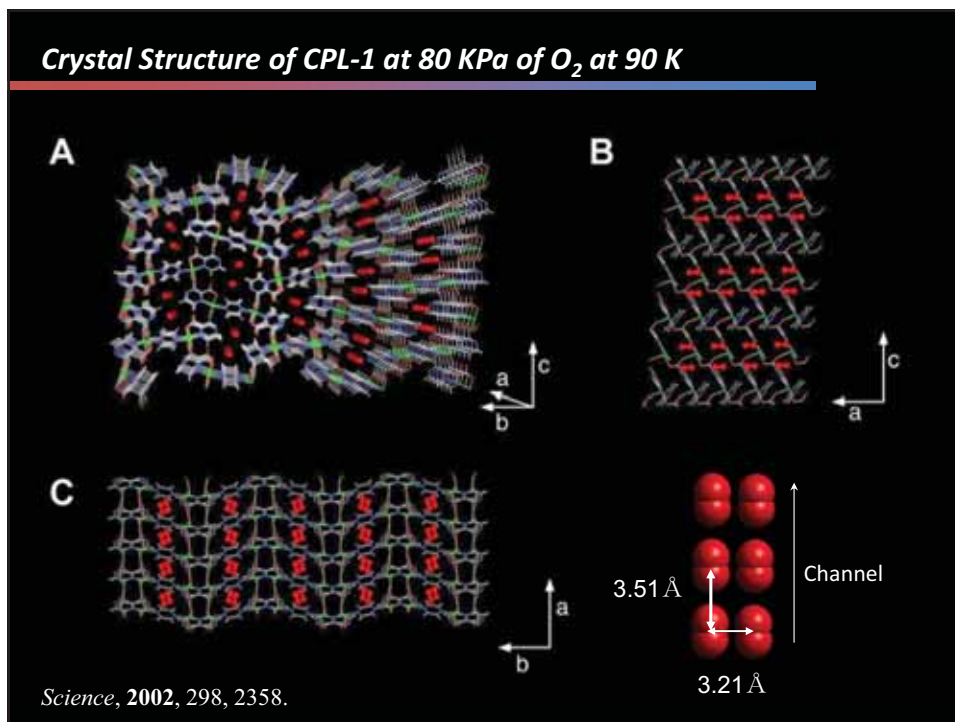
新たなサイエンス

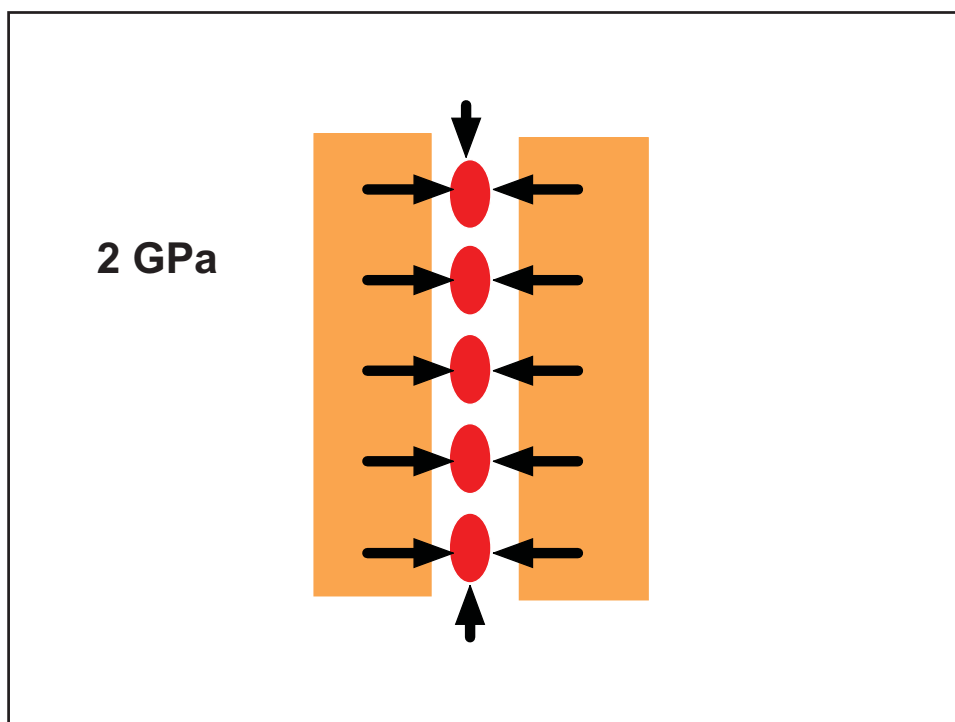
1. メゾスコピックサイエンス
2. 閉じ込め効果の新現象
- 擬圧効果
3. 究極分離細孔

CPL-1

New science in nanospace
— Ordered array of dioxygen
molecules —







Quasi-High Pressure Effect

Carbon nanotubes

High pressure (>200 atm) gas phase reaction occurs
below 1 atm

K.Kaneko et al, *J. Phys. Chem.* **95**,9955 (1991)
 $3(\text{NO})_2 = 2\text{N}_2\text{O} + (\text{NO}_2)_2$ 20MPa

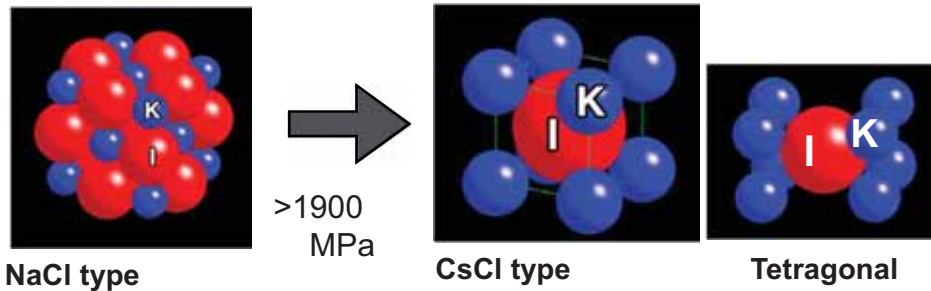
A.Fujishima et al, *J.Electrochem. Soc.* **147**, 3393 (2000).
Exp. study

K.E.Gubbins et al, *J.Chem.Phys.* **125**, 084711(2006).
Theoretical study

High pressure phase transition

Nanospaces induce

high pressure phase transition of KI



The structures of high-pressure phase can be formed in nanospaces.

done by Kaneko

最後に

Mesoscopic domain control and ...

*Bridge between
nanoscopic and macroscopic domain*