

**IAPWS**

**The International Association for the  
Properties of Water and Steam**

**What it is and why Canada is involved**

**Presentation to IAPWS Canadian National  
Committee**

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## IAPWS Core Business (1929)

- *Internationally recognized PVT data for boiler design*

# Properties of Water and Steam

- **1929 First Steam Conference (London)**
- **1964 International Skeleton Tables...Data grid**
- **1967 Formulation for Industrial Use**
- **1969 General formulations**
  - *ASME/IAPWS*
  - *Keenan, Keyes, Hill and Moore*
- **1984 “Scientific Formulation**
  - Haar, Ghallagher, Kell (NBS,NRC)
  - Core Helmholtz function
- **1995 New Scientific Formulation (Wagner)**
  - Better in supercooled, near-critical regions
- **1997 New Industrial Formulation**
  - Faster, more accurate than IF97

# High Temperature Water Chemistry

## History

- **1982 Need for data/models to support power cycle chemistry**
  - Less need for internationally recognized formulations for boiler design
- **IAPWS Role**
  - Forum for identifying needs, experimental methods, sources of funds
  - International formulations for dielectric constant data, and data for NaCl(aq)...measurement calibration standards

# High Temperature Water Chemistry

## Successes

- Water dissociation constant vs T and P
- Debye Huckel constants vs T and P
- Solubility, activity coefficients for NaCl(aq)
- Solubility of ZnO, Fe<sub>3</sub>O<sub>4</sub>
- Solubility, phase relations of iron phosphate hideout products
- Predictive equations for electrolytes, neutral species
- Henry's Law constants for dissolved gases
- Near-critical effects

# High Temperature Water Chemistry

## In Progress

- Volatility of copper, silica etc.
- pH sensors, standards
- Organic acids and bases
  - Ionization constants
  - Volatility
- Numerical simulations and equations of state
- “Atlas” project

# IAPWS

- **11 Member Countries**
  - Marshall and Mesmer, *J. Solution Chem.* 13, 383 (1984)
- **Annual international meeting (1 week)**
- **International Conf. on Properties of Water and Steam**
  - 5 year intervals
  - 1999 in Toronto; 2004 in Kyoto
- **Canadian National Committee**
  - Annual fee of \$1200 paid by NRCC
  - Industrial partner was CEA
  - Travel to (i) annual Canadian National Committee mtg;  
(ii) 2 members to international meeting
  - Representatives for CSC, CSME, CEA, NRC

# IAPWS Canadian National Committee

- **Critical mass**
  - 3 to 5 researchers
  - 3 to 5 industrial partners or sponsors
  - **Meaningful technology and manpower transfer**
- **Critical Issues**
  - 50% travel costs shared with researchers
  - Company participation
  - Central location for secretariat
- **COG as Industrial Partner**
  - Industrial partner was CEA
  - COG assumed responsibility for 2-year trial period
  - Travel costs paid from existing funds