

Fluid Workbench®

Software for Calculation of Thermophysical, Transport and Optic properties of gases, fluid and plasma

Fluid Workbench® is an easy-to-use simulation software tool aimed at the calculation of thermodynamic, heat-mass transfer and other transport coefficients, optic properties of homogeneous fluids, gases and plasma in wide range of the temperatures and pressures. It can be used to maintain of the user simulations by properties of the media data.

Fluid Workbench® is a software of data supplying for CFD calculations in combustion, high pressure discharges, high temperature chemical technologies, based on advanced scientific approaches.

Fluid Workbench® Highlights

- Calculated properties

- Thermodynamics

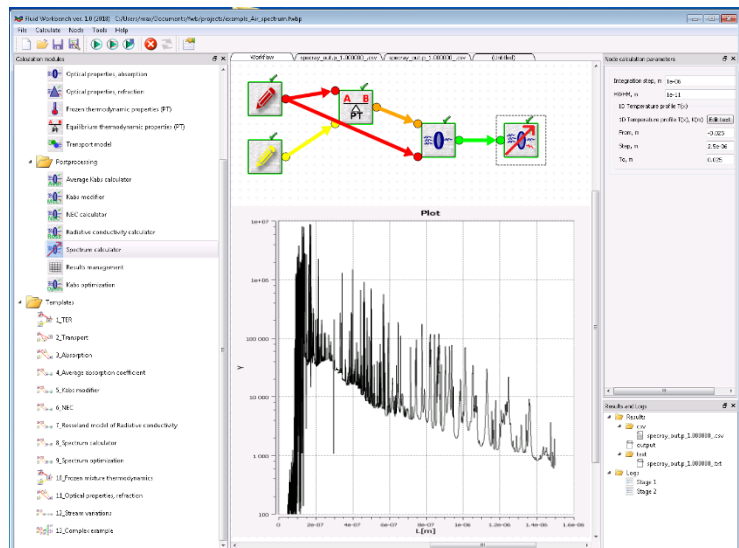
- Equilibrium composition, n_i
 - Heat capacity $C_p(T,P)$
 - Enthalpy $H(T,P)$

- Transport properties

- Viscosity coefficient $\mu(T,P)$
 - Binary Diffusion coefficient $D(T,P)$
 - Heat conduction coefficient $\lambda(T,P)$
 - Electrical conductivity $\sigma(T,P)$

- Optical properties

- Absorption coefficient $k_{abs}(T,P)$
 - Net Emission Coefficient $\epsilon_{net}(T,P)$
 - Radiative heat conductivity λ_{rad}
 - Refraction index
 - Radiated spectrum

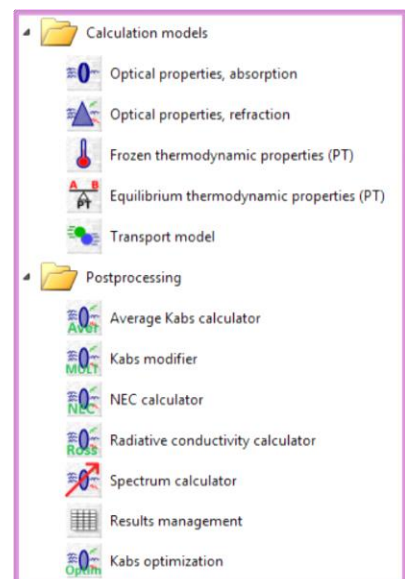


- Work up to 50 000K and 1000 bar
- Provide direct interface to commercial CFD codes

Fluid Workbench® Easy-to-Use Interface

- Easy-to-use graphic interface
- Extended set of the models for properties calculation
- Postprocessing of the results
- Many parametric calculation of the properties
- Optimization of the results
- Results review
- Results management
- Multiprocessor calculation for massive data generation
- Automatic atoms and molecules characteristic query from Kintech DB
- Automatic data transfer between models
- Results generation in the form of Look-up-tables
- Direct interface for results transfer to commercial CFD codes

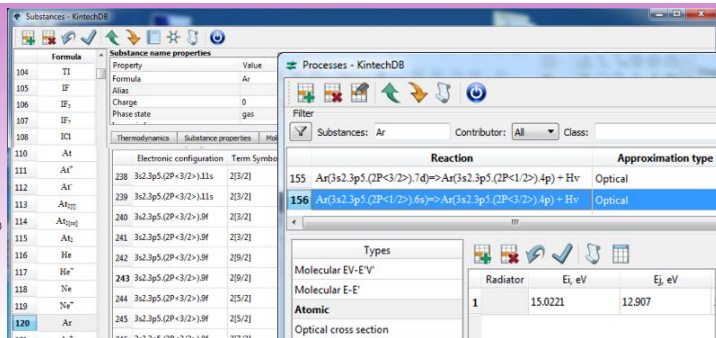
Set of models



Fluid Workbench® Database of Substances and Processes

Fluid Workbench® interacts with Kintech DB of properties of atoms and molecules

- **Integrated Database for easy mechanism construction**
- Thermodynamic property data for 4500 pure substances
- Electronic level energy structures for principal elements and structures
- Thermophysical data
- Automatic data transfer from Database to Fluid Workbench® calculations
- Saving data from Fluid Workbench® to the Database for future use
- Interaction potential data



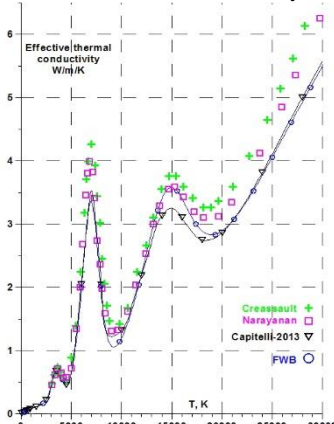
- Buckingham-Corner for 4 pairs
- Born-Mayer for 392 pairs
- Lennard-Jones for 935 species
- Stockayer for 21 spesies
- HFD-B(Aziz) for noble gases

- Pirani for 21 neutrals and 17 ions
- Devotofor 10 pairs
- Collision integrals for e-neutrals (21) and neutrals
- Modified L-J for 4 pairs

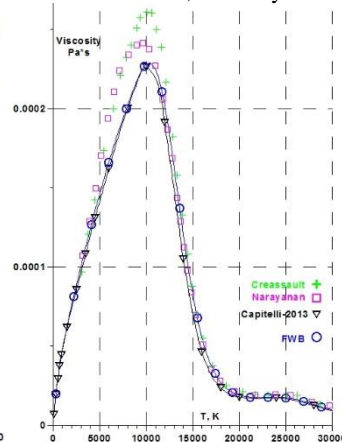
Fluid Workbench® Transport properties

- Accurate formulas of Chapman-Enskog method with account for higher approximations are implemented in FWB and used in all calculations under LTE conditions.
- Viscosity μ is calculated in the second approximation ($\xi=2$).
- Translational thermal conductivity $\lambda^{tr}(\xi)$, electrical conductivity $\sigma(\xi)$ are calculated in the second or third nonvanishing approximations
- Binary diffusion coefficients $BD_{ik}(\xi=1)$.
- Multicomponent diffusion coefficients $D_{ik}(\xi)$, $\xi=2$ or 3
- Total thermal conductivity $\lambda_{eff} = \lambda^{tr} + \lambda^{int} + \lambda_r$
- Effective heat capacity $C_{peff} = C_p + C_{pr}$

Air, thermal conductivity



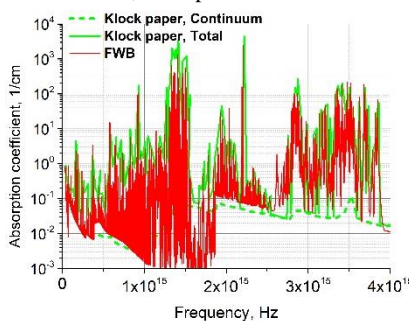
Air, viscosity



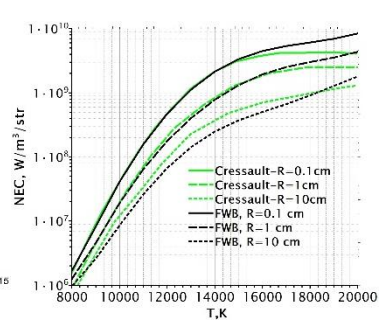
Fluid Workbench® Optic properties

- Generalized approach of bond-bound transitions
- Born-Oppenheimer+ Frank-Condon approximations for bound-bound transitions
- Quasi-classical approximation of wave functions for vibrational spectrum
- Hönl-London factor approximation for rotational spectrum
- Broadening: resonance, Doppler, quasistatic, impact, Stark, Van der Vaalse, ...

Cu, absorption coefficient



Air, Net emission coefficient



Fluid Workbench® Configurations and Purchase options

- Academic, Governmental and Commercial licenses
- Annual or perpetual licenses
- HPC capabilities
- Works on Windows PC, Unix-family PC and Mac OS

Contacts

Kintech Lab, Ltd.,
12, 3-ya Khoroshevskaya str.,
Moscow, Russia

+7 (499) 704-25-81
+7 (499) 704-25-81
info@kintechlab.com
www.kintechlab.com