Getting Thermodynamic and Transport Properties of Water in R

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IAPWS stands for International Association for the Properties of Water and Steam. One of its objectives is to provide formulations for thermodynamic and transport properties of water. The **iapws** package implements some of these formulations, in particular the so-called IAPWS-95 and IAPWS-IF97 formulations. The former is recommended for general and scientific use, the latter is designed for industrial use.

1 Installation

The simplest way to install **iapws** is to get it from CRAN. Type the following command in the R console:

```
> install.packages("iapws")
```

2 Usage

Let us load the **iapws** package:

```
> library(iapws)
```

And compute some water properties along the isochore `rho` $= 800$ kg/m^3:

```
> iapws95(c("p", "h"), rho = 800, t = seq(573, 623, by = 10))
```

```
             p        h
[1,]  72.58323 1323.453
[2,]  86.29644 1370.422
[3,] 100.03968 1417.171
[4,] 113.80655 1463.705
[5,] 127.59111 1510.032
[6,] 141.38777 1556.158
```

In this example, the pressure (`p`) and the specific enthalpy (`h`) are computed simultaneously for temperatures (`t`) between 573 K and 623 K. The units follows the convention used by the IAPWS, so pressures are in MPa and specific enthalpies are in kJ/kg. The different output properties and their units are listed in the function documentation (type `help(iapws95)` to see them all).

If more interested in isobaric properties, one can use:

```
> iapws95(c("rho", "h"), p = 0.101325,  # atmospheric pressure
+         t = seq(293, 373, by = 20))

          rho         h
[1,] 998.2380  83.37969
[2,] 992.2736 166.98937
[3,] 983.2729 250.62096
[4,] 971.8838 334.42576
[5,] 958.4569 418.53375
```

All the functions in **iapws** are vectorized. They take vectors as arguments and return vectors or arrays. Type `library(help = iapws)` for more information.

3 License

GPL-3.0-or-later