SFHo EoS with hyperons added

EoS Submission Details

EoS name	SFHo EoS with hyperons added
category	hadronic
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Abstract

This is the SFHoY EOS table [1] which is based on the statistical model with excluded volume and interactions of Hempel and Schaffner-Bielich (HS) [2] with RMF interactions SFHo [3][1], where the entire baryon octet has been considered. For the masses of nuclei, FRDM [4] was used. Contributions of electrons, positrons and photons are not included in the present table.

References to the original work

1. M. Fortin, M. Oertel, C. Providência, arxiv.org:1711.09427
2. M. Hempel and J. Schaffner-Bielich, Nucl. Phys. A 837 (2010) 210.
3. A.W. Steiner, M. Hempel, and T. Fischer, Astrophys.J. 774 (2013) 17.
4. P. Möller, J.R. Nix, and K.-L. Kratz, Atomic Data and Nuclear Data Tables 66 (1997) 131.

[1] Updated parameter values have been used for the calculation of the tables communicated by M. Hempel, see table below, to ensure a smooth transition from the purely nucleonic part to the hyperonic part.

Updated parameter values for the SFHo interaction

Please refer to Ref. [3] for the notations.

Quantity	Unit	
c_σ	fm	3.1791606374
c_ω	fm	2.2752188529
c_ρ	fm	2.4062374629
b		7.3536466626 $\times 10^{-3}$
c		-3.8202821956$\times 10^{-3}$
ζ		-1.6155896062 $\times 10^{-3}$
ξ		4.1286242877 $\times 10^{-3}$
a_1	fm^{-1}	-1.9308602647 $\times 10^{-1}$
a_2		5.6150318121 $\times 10^{-1}$
a_3	fm	2.8617603774 $\times 10^{-1}$
a_4	fm^2	2.7717729776
a_5	fm^3	1.2307286924
a_6	fm^4	6.1480060734 $\times 10^{-1}$
b_1		5.5118461115
b_2	fm^2	-1.8007283681
b_3	fm^4	4.2610479708 $\times 10^2$
m_σ	fm^{-1}	2.3689528914
m_ω	fm^{-1}	3.9655047020
m_ρ	fm^{-1}	3.8666788766

Nuclear Matter Properties[2]

	Quantity	Unit	
n_S	saturation density in symmetric matter	fm^{-3}	0.1583
E_0	binding energy per baryon at saturation	MeV	16.19
K	incompressibility	MeV	245.4
K'	skewness	MeV	-467.8
J	symmetry energy	MeV	31.57
L	symmetry energy slope parameter	MeV	47.10
K_{sym}	symmetry incompressibility	MeV	-205.4

Neutron Star Properties[2]

eos.thermo

eos.thermo and the three grid defining files are CompOSE standard data files and by definition available. eos.thermo does not necessarily provide all possible data.

[2] 0-values indicate, that the corresponding data is not provided.

	Quantity	Unit	
M_{max}	maximum mass	M_{sun}	1.99
$M_{DU,e}$	mass at DUrca threshold (1/9) w/o μ^-	M_{sun}	0
$R_{M_{max}}$	radius at maximum NS mass	km	10.3
$R_{1.4}$	radius at 1.4 M_{sun} NS mass	km	11.9

table dimension	3
table type	1
total number of grid points	1496880

Range and density (#) of the grid parameters:

	Quantity	Unit	min	max	#
T	Temperature	MeV	0.1E+00	0.15848932E+03	81
n_b	Baryon Nr Density	fm^{-3}	0.1E-11	0.19054607E+01	308
Y_q	Charge Fraction		0.10000000E-01	0.60000000E+00	60

T, n_b, and Y_q are stored in eos.t, eos.nb, and eos.yq, respectively.

Further Available Data Files

Files and quantities listed in the following are provided beyond CompOSE's core requirements as outlined in Sec.4.2. of the CompOSE manual.

eos.compo : available

index	particle
10	n
11	p
100	Λ
110	Σ^-
111	Σ^0
112	Σ^+
120	Ξ^-
121	Ξ^0
4002	${}^{2}_{4}$He
3002	${}^{2}_{3}$He
3001	${}^{1}_{3}$H
2001	${}^{1}_{2}$H
	- end of table -

The listed particle number fractions are net fractions, i.e., they are given by the difference between the correspoding particle and anti-particle fractions. Further particle sets are defined.

index	description
999	Average fraction, mass and proton number for all nuclei not listed above
	- end of table -

eos.micro : available

index	quantity	particle
10040	Landau effective mass divided by particle mass m_i^L/m_i	n
11040	Landau effective mass divided by particle mass m_i^L/m_i	p
100040	Landau effective mass divided by particle mass m_i^L/m_i	Λ
110040	Landau effective mass divided by particle mass m_i^L/m_i	Σ^-
111040	Landau effective mass divided by particle mass m_i^L/m_i	Σ^0
112040	Landau effective mass divided by particle mass m_i^L/m_i	Σ^+
120040	Landau effective mass divided by particle mass m_i^L/m_i	Ξ^-
121040	Landau effective mass divided by particle mass m_i^L/m_i	Ξ^0
	- end of table -	