

**Measurement and prediction of the volumetric and acoustic properties of
two biodiesel fuels up to 200 MPa**

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Table S1

Isothermal compressibility κ_T determine at temperatures T , and pressures p , in biodiesels MB-SF and MB-PRS ^a

$P /$ MPa	$T /$ K	$\kappa_T /$ GPa ⁻¹	$T /$ K	$\kappa_T /$ GPa ⁻¹	$T /$ K	$\kappa_T /$ GPa ⁻¹
MB-SF						
0.1	293.15	0.681	313.15	0.754	333.15	0.855
10	293.15	0.637	313.15	0.702	333.15	0.788
20	293.15	0.599	313.15	0.656	333.15	0.730
30	293.15	0.565	313.15	0.616	333.15	0.681
40	293.15	0.535	313.15	0.581	333.15	0.638
50	293.15	0.508	313.15	0.550	333.15	0.601
60	293.15	0.484	313.15	0.523	333.15	0.568
70	293.15	0.463	313.15	0.498	333.15	0.539
80	293.15	0.443	313.15	0.476	333.15	0.512
90	293.15	0.425	313.15	0.455	333.15	0.489
100	293.15	0.409	313.15	0.437	333.15	0.467
120	-	-	313.15	0.404	333.15	0.430
140	-	-	313.15	0.376	333.15	0.398
160	-	-	313.15	0.351	333.15	0.371
180	-	-	313.15	0.330	333.15	0.347
200	-	-	313.15	0.312	333.15	0.327
0.1	353.15	0.969	-	-	-	-
10	353.15	0.882	373.15	1.008	393.15	1.122
20	353.15	0.810	373.15	0.910	393.15	1.004
30	353.15	0.749	373.15	0.831	393.15	0.909
40	353.15	0.697	373.15	0.765	393.15	0.832
50	353.15	0.652	373.15	0.709	393.15	0.767
60	353.15	0.613	373.15	0.661	393.15	0.712
70	353.15	0.579	373.15	0.619	393.15	0.665
80	353.15	0.548	373.15	0.583	393.15	0.624
90	353.15	0.521	373.15	0.551	393.15	0.588
100	353.15	0.496	373.15	0.522	393.15	0.556
120	353.15	0.454	373.15	0.473	393.15	0.502
140	353.15	0.418	373.15	0.433	393.15	0.458
160	353.15	0.388	373.15	0.400	393.15	0.422
180	353.15	0.362	373.15	0.371	393.15	0.391
200	353.15	0.340	373.15	0.347	393.15	0.364

MB-PRS

0.1	293.15	0.651	313.15	0.736	333.15	0.826
10	293.15	0.613	313.15	0.687	333.15	0.765
20	293.15	0.580	313.15	0.644	333.15	0.711
30	293.15	0.550	313.15	0.606	333.15	0.666
40	293.15	0.524	313.15	0.573	333.15	0.626
50	293.15	0.500	313.15	0.543	333.15	0.591
60	293.15	0.478	313.15	0.517	333.15	0.559
70	293.15	0.458	313.15	0.493	333.15	0.532
80	293.15	0.440	313.15	0.471	333.15	0.506
90	293.15	0.424	313.15	0.452	333.15	0.484
100	293.15	0.408	313.15	0.433	333.15	0.463
120	-	-	313.15	0.402	333.15	0.427
140	-	-	313.15	0.374	333.15	0.396
160	-	-	313.15	0.351	333.15	0.370
180	-	-	313.15	0.330	333.15	0.347
200	-	-	313.15	0.312	333.15	0.327
0.1	353.15	0.932	-	-	-	-
10	353.15	0.853	373.15	0.962	-	-
20	353.15	0.786	373.15	0.876	393.15	0.967
30	353.15	0.730	373.15	0.805	393.15	0.880
40	353.15	0.681	373.15	0.745	393.15	0.809
50	353.15	0.639	373.15	0.694	393.15	0.748
60	353.15	0.603	373.15	0.650	393.15	0.697
70	353.15	0.570	373.15	0.611	393.15	0.652
80	353.15	0.541	373.15	0.577	393.15	0.613
90	353.15	0.515	373.15	0.547	393.15	0.579
100	353.15	0.491	373.15	0.520	393.15	0.549
120	353.15	0.450	373.15	0.473	393.15	0.497
140	353.15	0.416	373.15	0.435	393.15	0.454
160	353.15	0.387	373.15	0.402	393.15	0.419
180	353.15	0.361	373.15	0.374	393.15	0.388
200	353.15	0.339	373.15	0.350	393.15	0.362

^aThe combined expanded uncertainties U (level of confidence = 0.95) is $U(\kappa_T) = 0.04 \kappa_T$.

Table S2

Isentropic compressibility κ_S determine at temperatures T , and pressures p , in biodiesels MB-SF and MB-PRS ^a

$P /$ MPa	$T /$ K	$\kappa_S /$ GPa ⁻¹	$T /$ K	$\kappa_S /$ GPa ⁻¹	$T /$ K	$\kappa_S /$ GPa ⁻¹
MB-SF						
0.1	293.15	0.5659	313.15	0.6391	333.15	0.7204
10	293.15	0.5292	313.15	0.5919	333.15	0.6609
20	293.15	0.4979	313.15	0.5525	333.15	0.6105
30	293.15	0.4697	313.15	0.5191	333.15	0.5700
40	293.15	0.4454	313.15	0.4892	333.15	0.5350
50	293.15	0.4243	313.15	0.4635	333.15	0.5041
60	293.15	0.4047	313.15	0.4412	333.15	0.4774
70	293.15	0.3873	313.15	0.4207	333.15	0.4535
80	293.15	0.3724	313.15	0.4025	333.15	0.4327
90	293.15	0.3578	313.15	0.3857	333.15	0.4133
100	293.15	0.3453	313.15	0.3712	333.15	0.3966
120	-	-	313.15	0.3446	333.15	0.3663
140	-	-	313.15	0.3225	333.15	0.3417
160	-	-	313.15	0.3031	333.15	0.3200
180	-	-	313.15	0.2863	333.15	0.3018
200	-	-	313.15	0.2717	333.15	0.2848
0.1	353.15	0.8135	-	-	-	-
10	353.15	0.7412	373.15	0.8314	393.15	0.9345
20	353.15	0.6801	373.15	0.7551	393.15	0.8390
30	353.15	0.6284	373.15	0.6915	393.15	0.7651
40	353.15	0.5873	373.15	0.6418	393.15	0.7025
50	353.15	0.5500	373.15	0.5992	393.15	0.6525
60	353.15	0.5190	373.15	0.5632	393.15	0.6089
70	353.15	0.4907	373.15	0.5299	393.15	0.5723
80	353.15	0.4666	373.15	0.5020	393.15	0.5396
90	353.15	0.4440	373.15	0.4774	393.15	0.5112
100	353.15	0.4246	373.15	0.4549	393.15	0.4861
120	353.15	0.3912	373.15	0.4168	393.15	0.4444
140	353.15	0.3635	373.15	0.3859	393.15	0.4086
160	353.15	0.3393	373.15	0.3590	393.15	0.3788
180	353.15	0.3188	373.15	0.3371	393.15	0.3547
200	353.15	0.3006	373.15	0.3165	393.15	0.3327

MB-PRS

0.1	293.15	0.5706	313.15	0.6443	333.15	0.7261
10	293.15	0.5335	313.15	0.5959	333.15	0.6642
20	293.15	0.5008	313.15	0.5558	333.15	0.6146
30	293.15	0.4735	313.15	0.5208	333.15	0.5732
40	293.15	0.4484	313.15	0.4921	333.15	0.5369
50	293.15	0.4270	313.15	0.4662	333.15	0.5067
60	293.15	0.4070	313.15	0.4431	333.15	0.4790
70	293.15	0.3899	313.15	0.4228	333.15	0.4552
80	293.15	0.3746	313.15	0.4042	333.15	0.4345
90	293.15	0.3602	313.15	0.3877	333.15	0.4151
100	293.15	0.3474	313.15	0.3724	333.15	0.3979
120	-	-	313.15	0.3457	333.15	0.3677
140	-	-	313.15	0.3237	333.15	0.3425
160	-	-	313.15	0.3041	333.15	0.3209
180	-	-	313.15	0.2874	333.15	0.3015
200	-	-	313.15	0.2727	333.15	0.2854
0.1	353.15	0.8229	-	-	-	-
10	353.15	0.7461	373.15	0.8372	-	-
20	353.15	0.6832	373.15	0.7600	393.15	0.8440
30	353.15	0.6315	373.15	0.6988	393.15	0.7687
40	353.15	0.5888	373.15	0.6463	393.15	0.7069
50	353.15	0.5519	373.15	0.6017	393.15	0.6552
60	353.15	0.5205	373.15	0.5651	393.15	0.6117
70	353.15	0.4932	373.15	0.5327	393.15	0.5751
80	353.15	0.4683	373.15	0.5042	393.15	0.5416
90	353.15	0.4464	373.15	0.4792	393.15	0.5136
100	353.15	0.4281	373.15	0.4567	393.15	0.4879
120	353.15	0.3932	373.15	0.4195	393.15	0.4443
140	353.15	0.3642	373.15	0.3873	393.15	0.4096
160	353.15	0.3397	373.15	0.3596	393.15	0.3799
180	353.15	0.3192	373.15	0.3366	393.15	0.3541
200	353.15	0.3017	373.15	0.3171	393.15	0.3336

^a The combined expanded uncertainties U (level of confidence = 0.95) are $U(\kappa_S) = 0.0042 \kappa_S$ up to 100 MPa, $U(\kappa_S) = 0.0063 \kappa_S$ between (100 and 200).

Table S3

Acoustic impedance Z determine at temperatures T , and pressures p , in biodiesels MB-SF and MB-PRS ^a

$P /$ MPa	$T /$ K	$Z /$ MPa·s·m ⁻¹	$T /$ K	$Z /$ MPa·s·m ⁻¹	$T /$ K	$Z /$ MPa·s·m ⁻¹
MB-SF						
0.1	293.15	1.249	313.15	1.166	333.15	1.088
10	293.15	1.296	313.15	1.216	333.15	1.141
20	293.15	1.340	313.15	1.262	333.15	1.191
30	293.15	1.384	313.15	1.307	333.15	1.237
40	293.15	1.425	313.15	1.350	333.15	1.282
50	293.15	1.464	313.15	1.391	333.15	1.324
60	293.15	1.502	313.15	1.429	333.15	1.365
70	293.15	1.540	313.15	1.467	333.15	1.404
80	293.15	1.573	313.15	1.504	333.15	1.441
90	293.15	1.609	313.15	1.540	333.15	1.478
100	293.15	1.641	313.15	1.573	333.15	1.513
120	-	-	313.15	1.640	333.15	1.581
140	-	-	313.15	1.701	333.15	1.644
160	-	-	313.15	1.762	333.15	1.705
180	-	-	313.15	1.819	333.15	1.762
200	-	-	313.15	1.873	333.15	1.820
0.1	353.15	1.015	-	-	-	-
10	353.15	1.068	373.15	1.000	393.15	0.935
20	353.15	1.120	373.15	1.055	393.15	0.992
30	353.15	1.170	373.15	1.107	393.15	1.044
40	353.15	1.214	373.15	1.153	393.15	1.095
50	353.15	1.259	373.15	1.198	393.15	1.140
60	353.15	1.300	373.15	1.240	393.15	1.185
70	353.15	1.341	373.15	1.282	393.15	1.226
80	353.15	1.379	373.15	1.322	393.15	1.267
90	353.15	1.418	373.15	1.359	393.15	1.306
100	353.15	1.453	373.15	1.396	393.15	1.343
120	353.15	1.521	373.15	1.466	393.15	1.412
140	353.15	1.585	373.15	1.530	393.15	1.479
160	353.15	1.647	373.15	1.593	393.15	1.543
180	353.15	1.706	373.15	1.650	393.15	1.601
200	353.15	1.763	373.15	1.710	393.15	1.660

MB-PRS

0.1	293.15	1.243	313.15	1.160	333.15	1.083
10	293.15	1.290	313.15	1.210	333.15	1.137
20	293.15	1.335	313.15	1.258	333.15	1.186
30	293.15	1.377	313.15	1.303	333.15	1.233
40	293.15	1.419	313.15	1.345	333.15	1.278
50	293.15	1.458	313.15	1.385	333.15	1.320
60	293.15	1.497	313.15	1.425	333.15	1.361
70	293.15	1.533	313.15	1.462	333.15	1.400
80	293.15	1.567	313.15	1.499	333.15	1.437
90	293.15	1.602	313.15	1.534	333.15	1.473
100	293.15	1.634	313.15	1.569	333.15	1.508
120	-		313.15	1.635	333.15	1.576
140	-		313.15	1.696	333.15	1.640
160	-		313.15	1.757	333.15	1.701
180	-		313.15	1.813	333.15	1.761
200	-		313.15	1.867	333.15	1.816
0.1	353.15	1.009	-	-	-	-
10	353.15	1.064	373.15	0.996	-	-
20	353.15	1.117	373.15	1.051	393.15	0.989
30	353.15	1.166	373.15	1.100	393.15	1.042
40	353.15	1.212	373.15	1.148	393.15	1.091
50	353.15	1.256	373.15	1.194	393.15	1.137
60	353.15	1.297	373.15	1.237	393.15	1.181
70	353.15	1.336	373.15	1.278	393.15	1.223
80	353.15	1.375	373.15	1.317	393.15	1.264
90	353.15	1.412	373.15	1.355	393.15	1.302
100	353.15	1.446	373.15	1.392	393.15	1.339
120	353.15	1.515	373.15	1.459	393.15	1.411
140	353.15	1.582	373.15	1.526	393.15	1.476
160	353.15	1.644	373.15	1.590	393.15	1.539
180	353.15	1.703	373.15	1.650	393.15	1.601
200	353.15	1.757	373.15	1.706	393.15	1.656

^a The combined expanded uncertainties U (level of confidence = 0.95) are $U(Z) = 0.0023 Z$ up to 100 MPa, $U(Z) = 0.0036 Z$ between (100 and 200).