High Pressure Behavior of Oil Extracted from Green Alga Botryococcus braunii

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Abstract

Green alga Botryococcus braunii is regarded as a potential source of bio-diesel fuel because of its ability to produce large amounts of hydrocarbons and its widespread in the world. One of the most potential oil extracted from green alga B. braunii was investigated for its rheological behavior and state transition under high pressure at different temperatures. The results were compared with that of other natural oils such as squalene and squalane.

Table 1 Viscosity at atmosphere pressure and pressure viscosity coefficient of typical natural oils

	Dyn. Visc. mm^2/s		Pres. Visc. Coeff. GPa^{-1}	
	40°C	100°C	20°C	40°C
B. braunii	13.8	3.5	21.0	14.6
Squalene	9.9	3.2	13.2	11.9
Squalane	18.6	6.1	16.9	(11.3)
PAO17	17.1	4.0	12.8	11.1

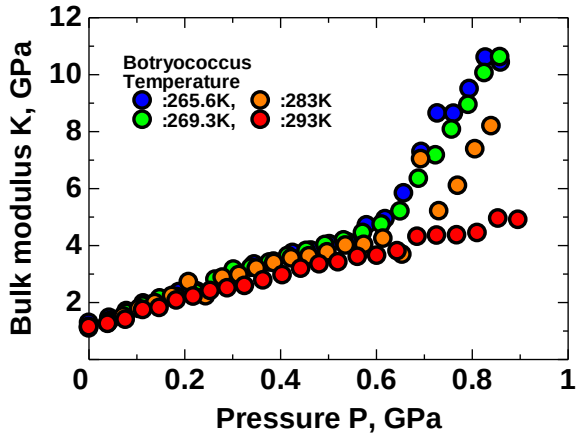

Fig.1 Dependence of bulk modulus of B. braunii oil on pressure at different temperatures

Figure 1 shows that the bulk modulus of B. braunii oil increases almost linearly with pressure until a critical pressure. When the pressure exceeded the critical value the increase in the bulk modulus was accelerated. This critical pressure is the liquid-to-solid transitional pressure of the oil.

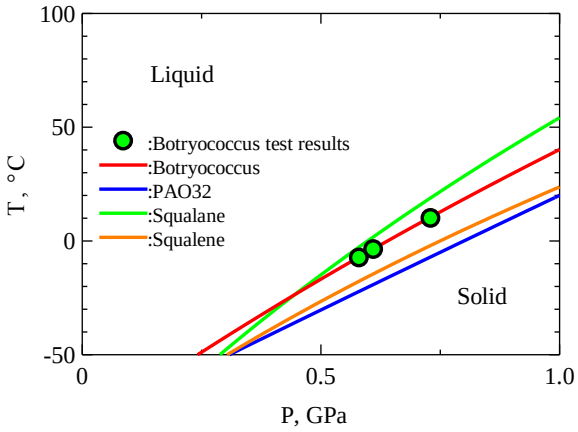

Fig.2 Phase diagram of B. braunii oil together with that of squalane, squalene and PAO32.

Figure 2 shows that B. braunii oil has a very similar behavior to that of PAO32 and squalene, except that the liquid-to-solid transition temperature is a little higher than that of both PAO32 and squalene.

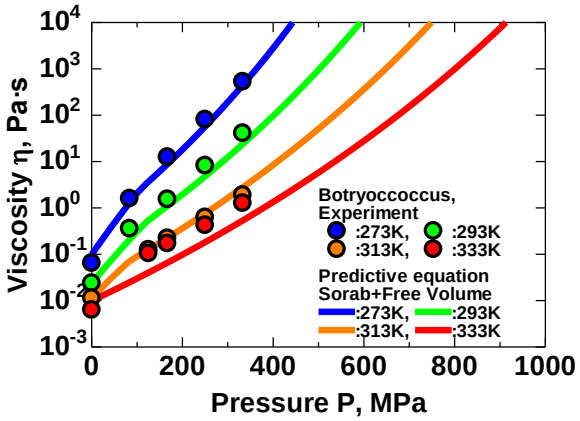

Fig.3 Dependence of viscosity on pressure at different temperatures for B. braunii oil

The viscosity of the B. braunii oil increases with the pressure at the all experimental temperatures, and the dependence of viscosity on both pressure and temperature may be expressed approximately by the Sorab and the free volume equations, of which the results are also given in Fig. 3.