Parameters for removing sulfur from Dibenzothiophene using ultrasonication system and biodesulfurization microbes

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A promising "Eco Technology" to remove Sulfur from oil is to employ Biodesulfurization (BDS), a process where the bacteria (liquid phase) are mixed with oil at ambient temperature and pressure and remove selectively, the organosulfur components from oil fractions without degrading the carbon skeleton of the compounds. In the present study various environmental samples were collected, such as polluted soil, granular sludge, compost material etc., and were tested for microbial enrichment and DBT-guided isolation of bacteria both in aerobic and anaerobic conditions. Isolation of bacteria from environmental samples that can biodesulfurize Dibenzothiophene (DBT) revealed two aerobic bacteria (*Serratia sp.* and Burkholderia *sp.*) and a consortium of anaerobic bacteria (*Pseudomonas sp.*, *Herbaspirillum sp.*, *Leptolinea sp.*, *etc*). Furthermore, a circular unfocused ultrasonic transducer operating at 28 KHz was used in order to increase BDS performance. Various parameters were tested such as concentration and temperature of the initial solution, solvent used and time of ultrasonication (table 1).

Table 1. Parameters used through ultrasonication

	Samples	Solution	Concentration	Temperature (ºC)	Time (min)	kHz	Parameter measured
1	DBT	Aqueous	250ppm	25; 70	30; 60	28	DBT (GC-FID)
2	DBT	Heptane	300 ppm	25	30; 60	28	DBT (GC-FID)

An increase in DBT concentration is observed in both temperatures that were performed. On heated (T=70ºC) experiments there is a lesser increase of DBT concentration. Decrease of 2-HBP concentration was observed in relation to DBT performance (Fig 1). Temperature is rising due to sonication process which may affect the solubility of the studied organic compounds. It is concluded that sonication may enhance DBT solubility in an aqueous solution resulting in better performance through the 4S pathway which finally, can shorten the 4S pathway into 2-steps pathway.

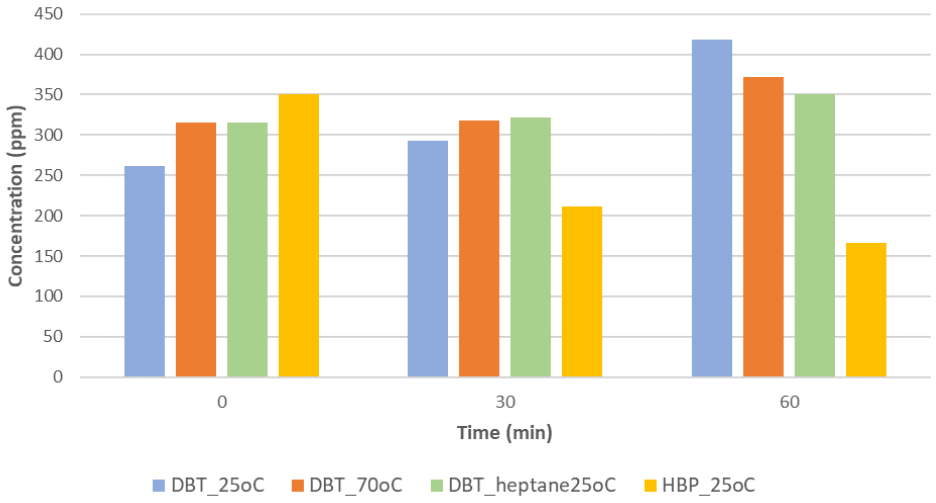

Figure 1. Ultrasonication results for DBT and 2-HBP solutions

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