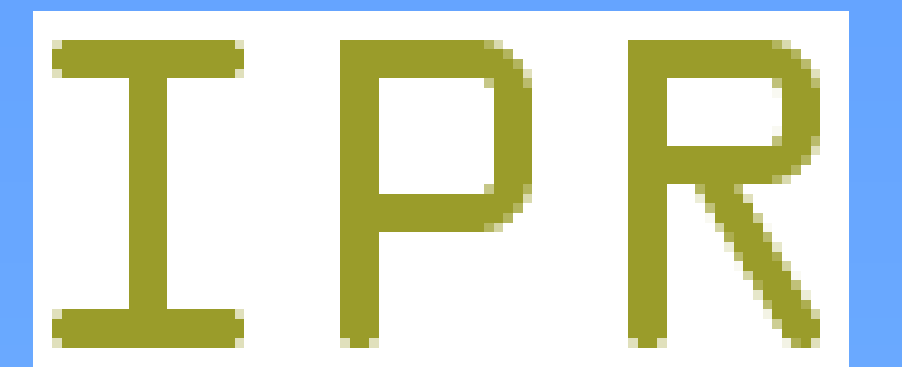


Synthesis and Characterization of Modified Polyisobutylene Succinimide Dispersants



Dispersants

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Introduction

Succinimide-based dispersants are the most commonly used dispersants in the oil industry. The dispersants are able to prevent the aggregation of carbon-rich particles generated during engine operation, and consequently reduce the production of sludge and the emission of fine particles into the air that cause air pollution.

Two Major Problems in the Oil Industry



Figure 1: Sludge formed in the engine (left), and fine particle emission (right).

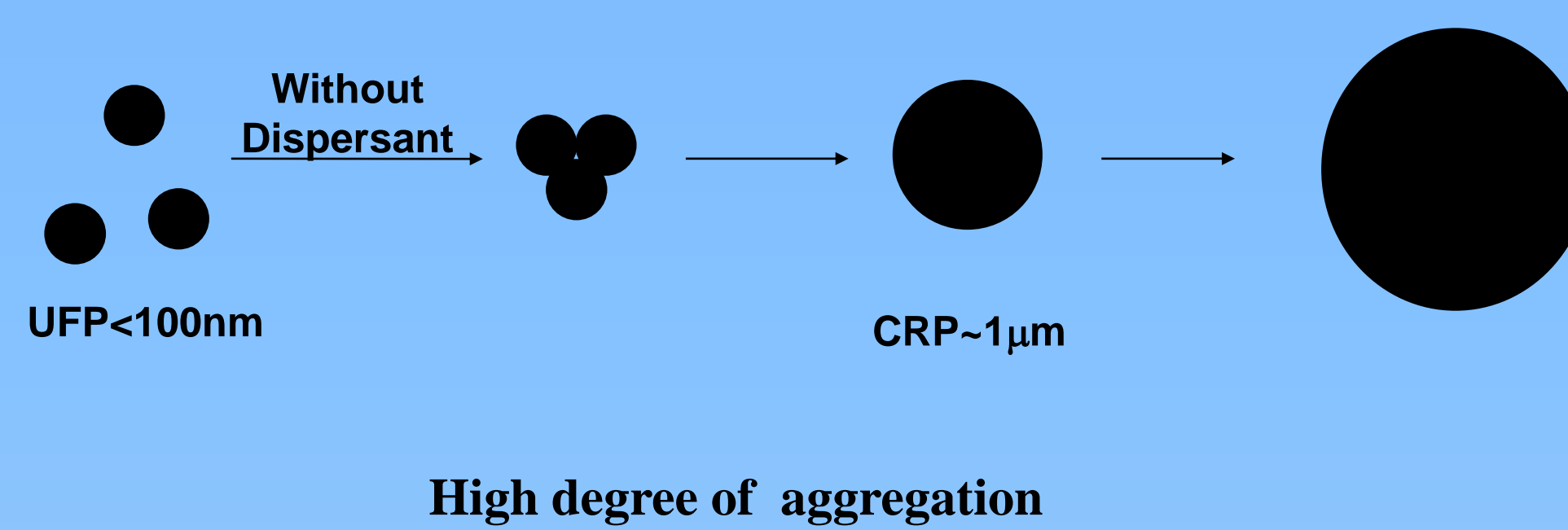
Most of the engine oil in the market is composed of two parts. About 90% of the oil is base stock. It determines the physical properties of the oil. The other 10% of the oil is the additives, which determines the chemical properties of the oil. Dispersant is one of the most commonly used additives in the engine oil. It stabilizes efficiently the ultra fine particles (UFPs) generated during the regular operation of the engine.



Figure 2: Two identical valves in a Mercedes engine after operating for 72 hours using engine oil with (right) and without (left) oil additives.

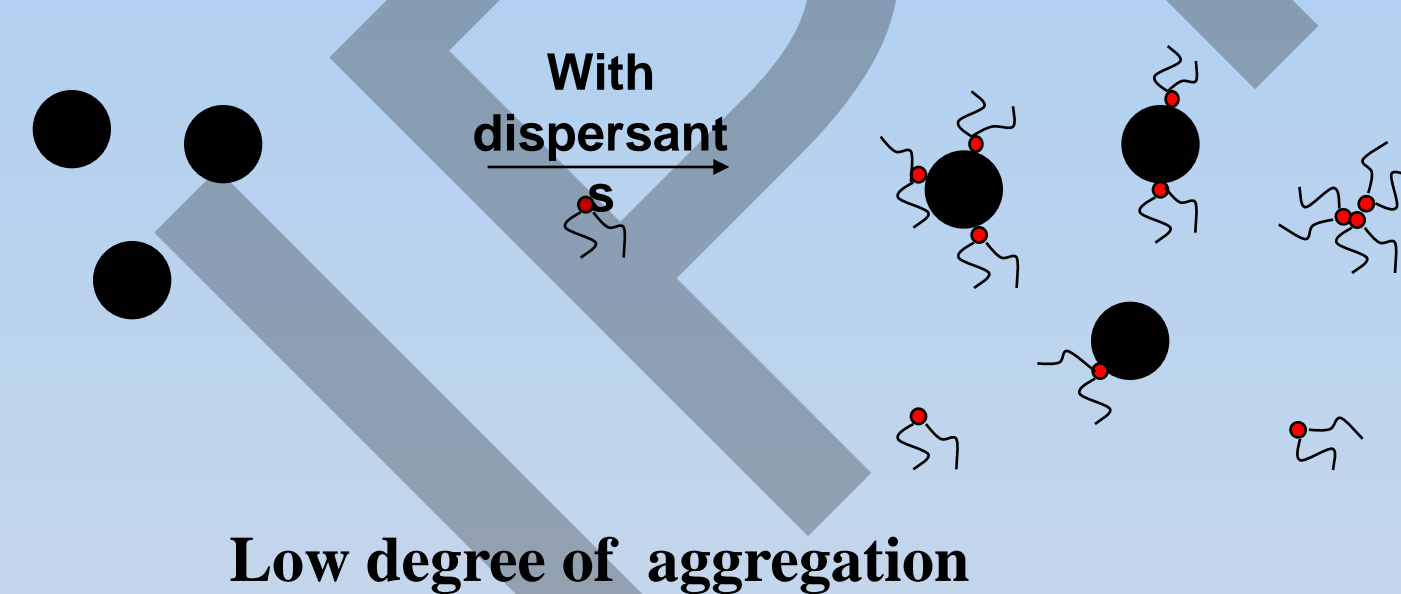
What Happens in the Engine Oil

UFPs are generated in the engine oil during the normal operation of the engine. They tend to aggregate together to form large carbon rich particles (CRPs). Further aggregation of the large CRPs form sludge.



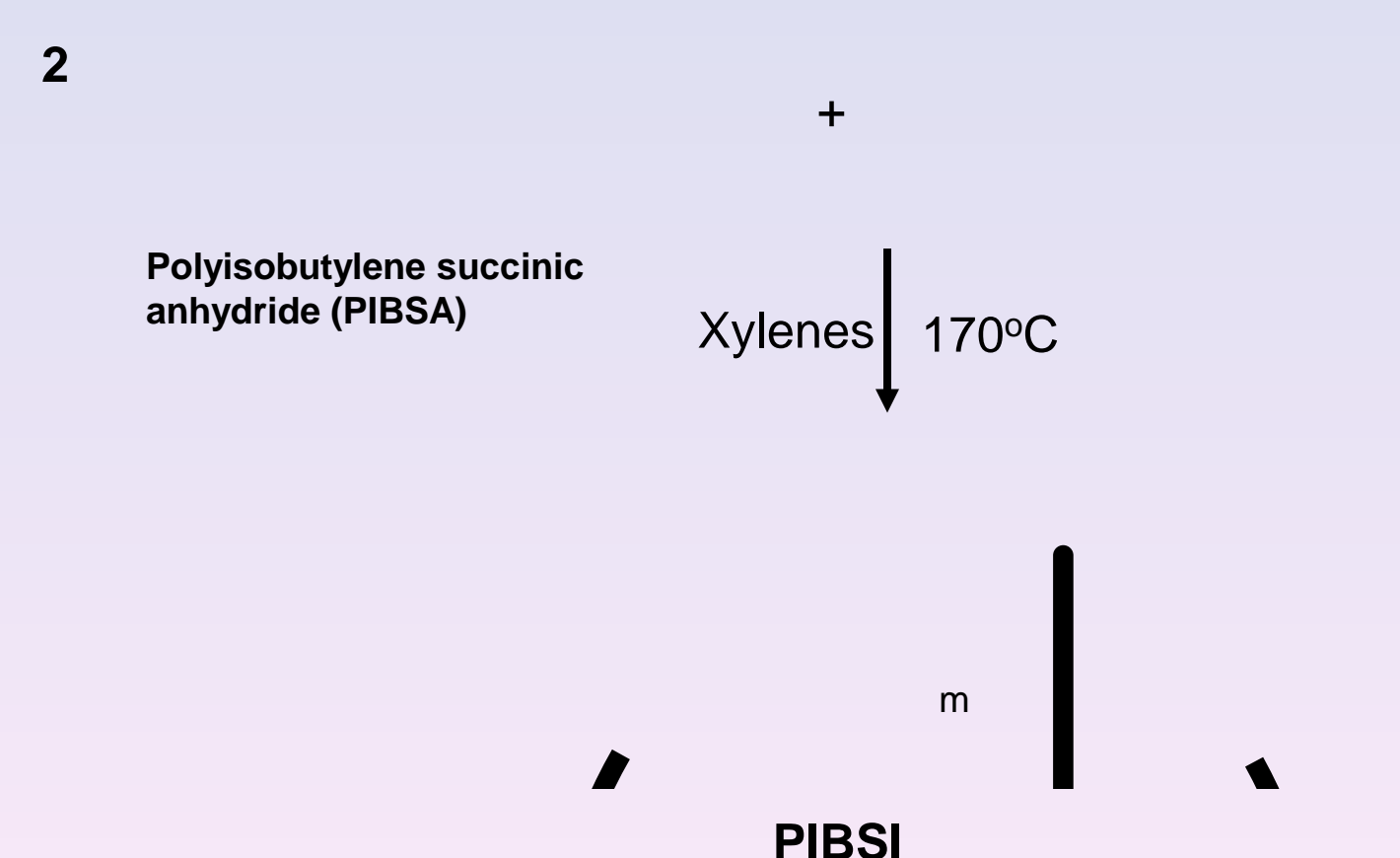
What Dispersants do in the Engine Oil

The polar MOIETY of the dispersant adsorb onto the CRP surface. It help to solubilize the CRP in the oil, and the apolar chains of the dispersants also help to shield the CRPs from each other, reduce the aggregation of the CRPs, and as a result, reduce the sludge formation.



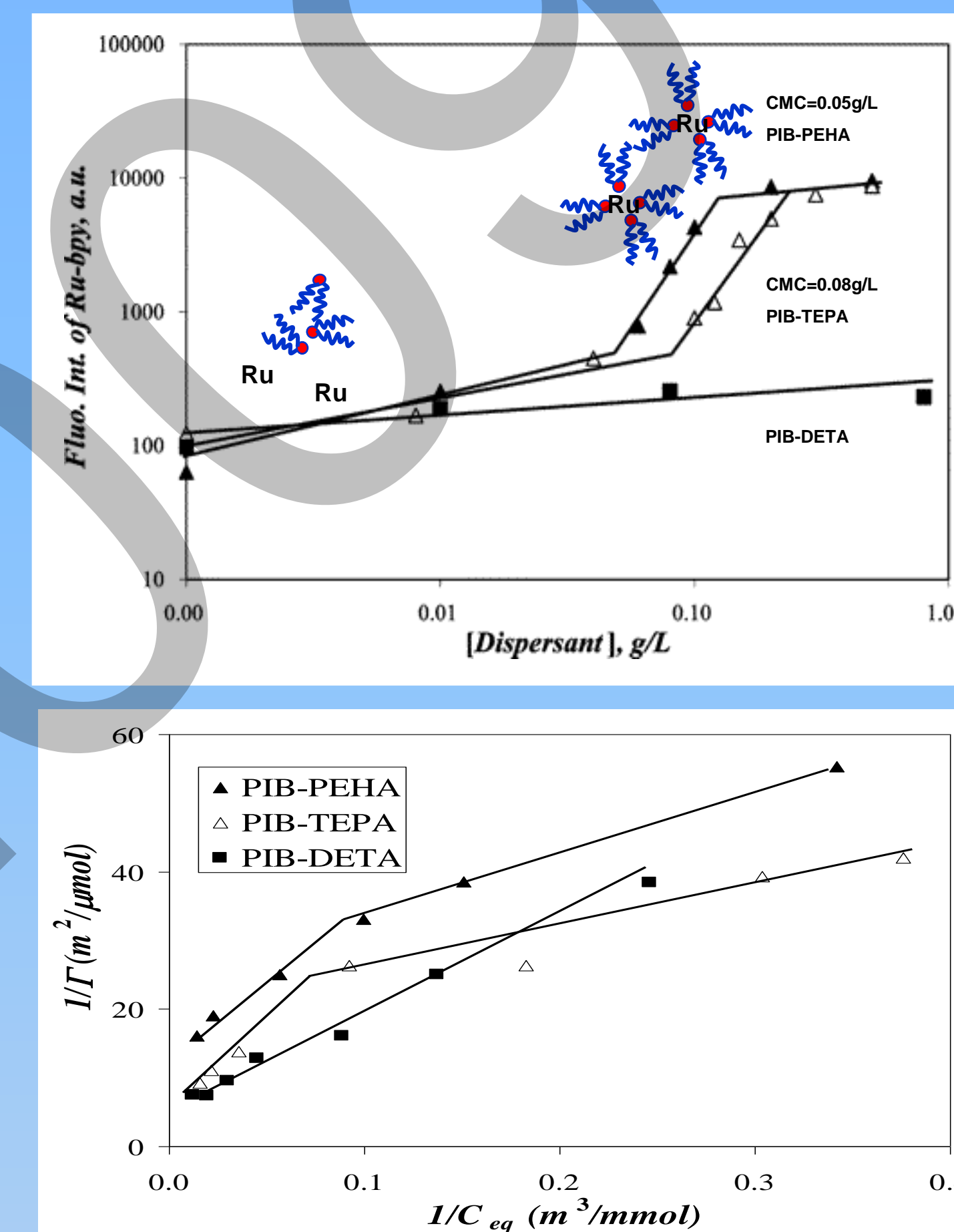
Polyisobutylene Succinimide (PIBSI) Dispersant Previously Studied

PIBSI has two long apolar isobutylene chains connected by one polar polyamine centre.



Research on PIBSI Dispersant

The formation of PIBSI micelles was formed to affect the adsorption of PIBSI dispersants onto carbon black particles.

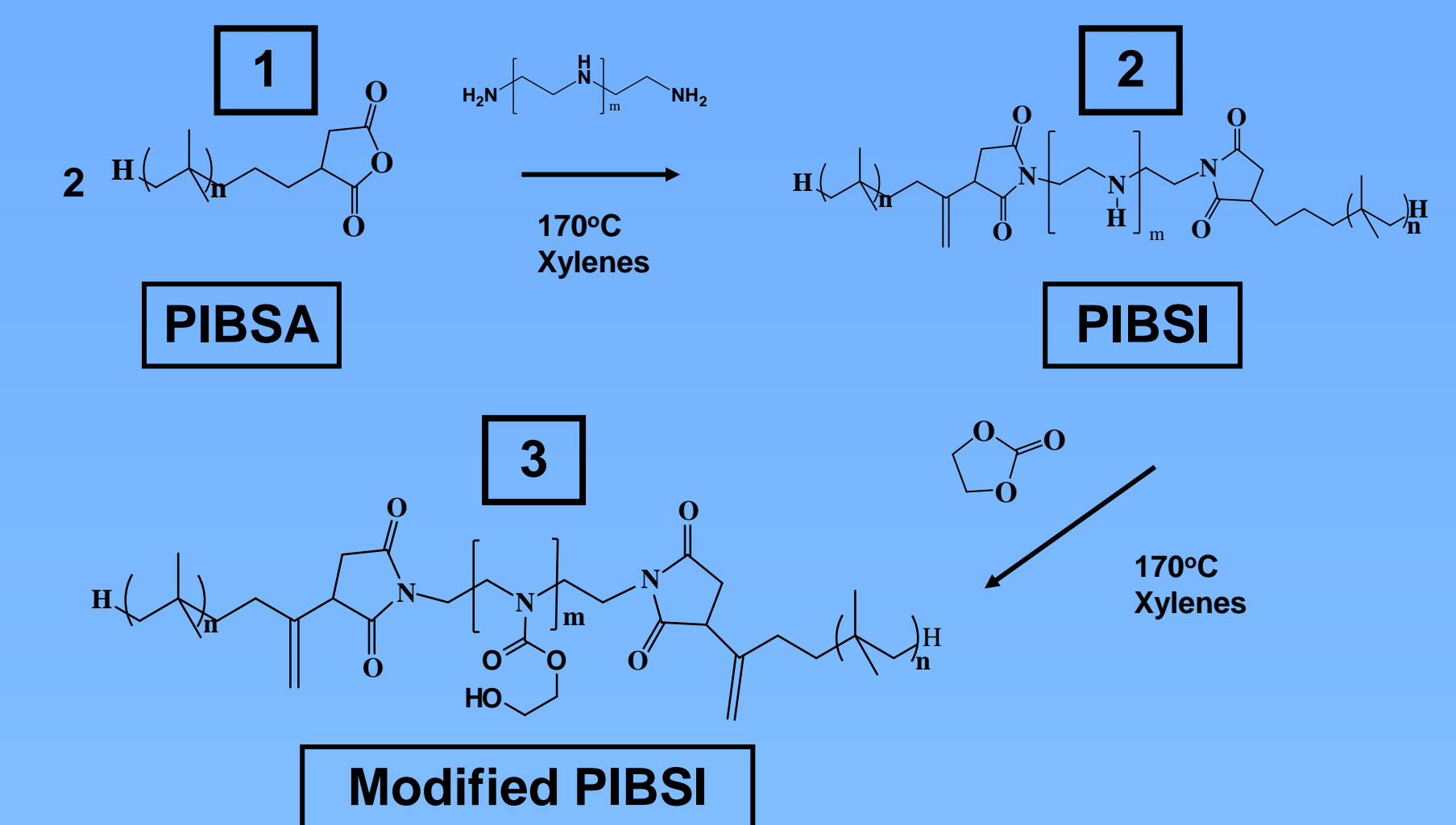


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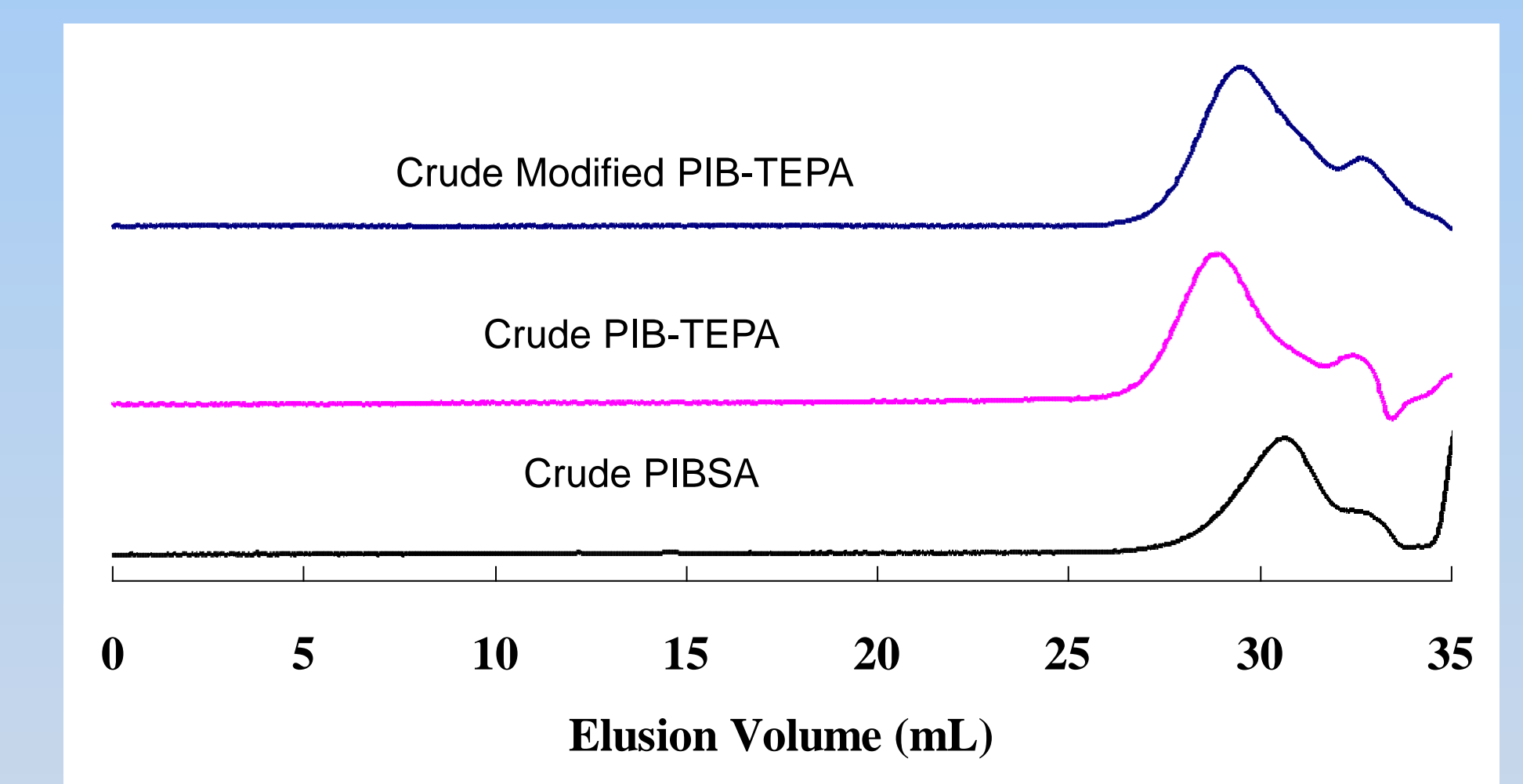
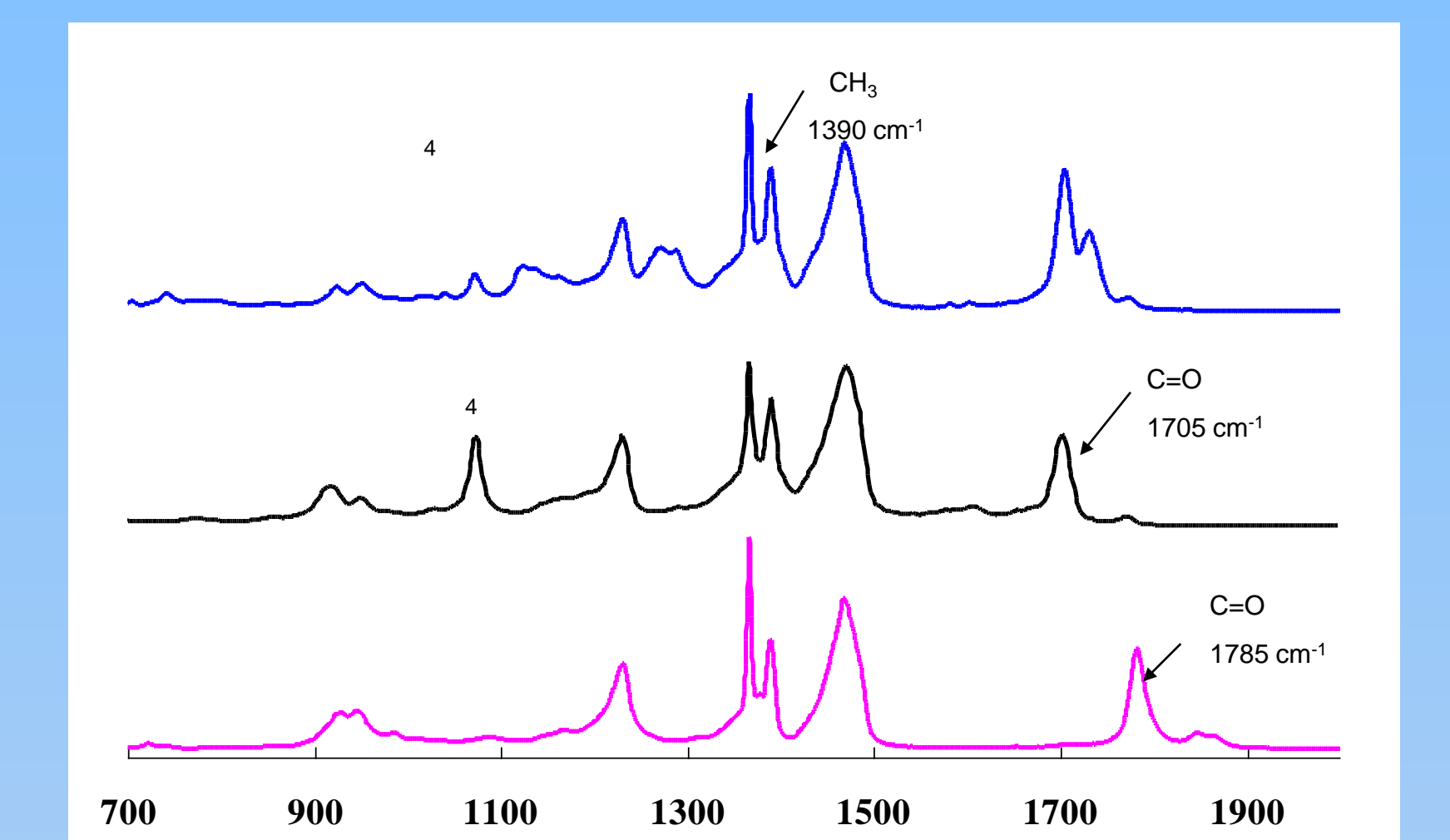
PIBSI Dispersant Modified with Ethylene Carbonate

The modified PIBSI is synthesized by reacting PIBSI with ethylene carbonate.

Synthesis Protocols



Characterization of Modified Dispersants



The crude dispersant is then purified by column chromatography.

Future Work

Investigation of dispersant efficiency of the modified dispersants.

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The modified PIBSI dispersants are reported to possess a better dispersancy properties as applied in engine oil.