The Development of an Innovative Demulsifier for the Separation of an Emulsion of Water-Soluble Cutting Oil

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Though water-soluble cutting oil is an essential material for metal-cutting processes, its release into the water system prompts significant contaminations. Since the emulsion of water and oil cannot be completely separated, it is difficult to recycle and often designated as waste for incineration. To solve this problem, we developed a more effective demulsifier using pine powder with a lignin content of more than 50%. When pine powder and sulfuric acid were added to 5% water-soluble cutting oil, the emulsion removal effect was confirmed. At first, the process took 3 weeks at room temperature, but it was later reduced to 1 hour at 80?. To identify the demulsifying component of pine powder, we conducted an experiment using pine extract and fir tree, confirming that lignin is a demulsifying component. Then, by comparing calcium lignin sulfonate to sodium lignin sulfonate, we confirmed that both substances had a high demulsifying effect, yet calcium lignin sulfonate showed a greater demulsification performance. As such, we confirmed that treating 200 ml of water-soluble cutting oil emulsion with 0.016 g of calcium lignin sulfonate and sulfuric acid (0.048 M) removes emulsion by nearly 100%. Finally, we performed a bottle test using calcium lignin sulfonate on the artificial emulsion made by combining crude oil and surfactant (Tween 20). The lignin sulfonate showed a superior demulsifying effect compared to the control group, signifying that our demulsifier can be used not only for purifying water-soluble cutting oil but also as a demulsifier in various fields, including the crude oil industry.

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