

## Answer on Question #50498, Chemistry, Other

CAN YOU TELL ME HOW DEMULSIFIER MECHANISM ACT? BECAUSE EMULSIFIER AND DEMULSIFIER STRUCTURE IS THE SAME BOTH OF THEM HAVE POLAR AND NON POLAR HEAD?FOR EXAMPLE IN CRUDE OIL IN DESALTER.

### **Explanation:**

Demulsifiers, or emulsion breakers, are a class of specialty chemicals used to separate emulsions (e.g. water in oil). They are commonly used in the processing of crude oil, which is typically produced along with significant quantities of saline water. This water (and salt) must be removed from the crude oil prior to refining. If the majority of the water and salt are not removed, significant corrosion problems can occur in the refining process.

Demulsification, the separation of an emulsion into its component phases, is a two-step process. The first step is flocculation (aggregation, agglomeration, or coagulation). The second step is coalescence. Either of these steps can be the rate-determining step in emulsion breaking.

### ***Flocculation or aggregation***

The first step in demulsification is the flocculation of water droplets. During flocculation, the droplets clump together, forming aggregates or "floccks." The droplets are close to each other, even touching at certain points, but do not lose their identity (i.e., they may not coalesce). Coalescence at this stage only takes place if the emulsifier film surrounding the water droplets is very weak. The rate of flocculation depends on the following factors.

- Water content in the emulsion. The rate of flocculation is higher when the water cut is higher.
- Temperature of the emulsion is high. Temperature increases the thermal energy of the droplets and increases their collision probability, thus leading to flocculation.
- Viscosity of the oil is low, which reduces the settling time and increases the flocculation rate.
- Density difference between oil and water is high, which increases the sedimentation rate.
- An electrostatic field is applied. This increases the movement of droplets toward the electrodes, where they aggregate.

### ***Coalescence***

Coalescence is the second step in demulsification. During coalescence, water droplets fuse or coalesce together to form a larger drop. This is an irreversible process that leads to a decrease in the number of water droplets and eventually to complete demulsification. Coalescence is enhanced by the following factors.

- High rate of flocculation increases the collision frequency between droplets.
- The absence of mechanically strong films that stabilize emulsions.
- High interfacial tension. The system tries to reduce its interfacial free energy by coalescing.
- High water cut increases the frequency of collisions between droplets.
- Low interfacial viscosity enhances film drainage and drop coalescence.
- Chemical demulsifiers convert solid films to mobile soap films that are weak and can be ruptured easily, which promotes coalescence.
- High temperatures reduce the oil and interfacial viscosities and increase the droplet collision frequency.