SUSPENSION POLYMERIZATION OF HIGHER ALPHA OLEFINS IN PERFLUOROALKANE MEDIA AS A METHOD OF DRAG REDUCING AGENT PREPARATION

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Nowadays Drag Reducing Agents are widely applied for increasing the capacity of crude oil pipelines. They use Toms Phenomenon when introducing of small amounts of oil-soluble high molecular weight (MW) polymer results in significant growth of flow rate. The more MW of a polymer, the more effective it is. (Co)Polymers of higher alpha olefins prepared through Ziegler-Natta polymerization may have extremely high MW and therefore they are the functional component of almost all commercial flow improvers.

Polymer is introduced into the pipeline in the form of solution or suspension. The latter is more preferable because of lower viscosity and greater polymer content. Polymer suspension may be prepared either by precipitation from the polymer solution, or by comminuting of the bulk polymer. Both cases include rather cumbersome step of dispersion production after the step of polymerization.

Application of perfluoroalkane (PFA) media allows to carry out the classic suspension polymerization (i.e. droplets of monomer convert into polymer particles) of higher alpha olefins in the contact with the Ziegler-Natta catalyst. So, polymerization and dispersion production are combined into one step. It becomes possible because PFAs are immiscible neither with monomer, nor with the polymer, nor with the components of Ziegler-Natta catalyst, nor with saturated hydrocarbons.

Another special feature of PFAs is their high chemical inertness, so they don't react with organometallic compounds of Ziegler-Natta catalyst and don't deactivate them.

One more advantage of suspension polymerization is easy transfer of polymerization heat. For example, bulk polymerization applies rigid limitations on reaction vessel geometry and catalyst concentration to avoid local overheating. That is why durability of bulk polymerization may be over 10 days.

When the suspension polymerization is over PFA media must be replaced with another non-solvent (alcohol or glycol). The density of PFA is about 2,0 g/cm3 and that is more than twice greater than polymer density, 0,83 g/cm3. This difference helps to separate one from another.

The only disadvantage of PFAs is their high cost, but their consumption is minimal.

So, we may resume that suspension polymerization of higher alpha olefins permits to carry out the production of flow improver in a more effective mode.