MINING

Copper-Lead-Zinc ores

The Cu-Pb-Zn separation process is among the most challenging flotation separations primarily because the first step must entail bulk flotation of the two most readily floatable minerals with these two minerals separated in a differential flotation stage. In this case, as a general rule because both copper and lead minerals tend to float well, these are usually the target bulk flotation minerals. Therefore the standard Cu-Pb-Zn flotation practice involves an initial flotation of a Cu-Pb bulk concentrate followed by two parallel circuit stages of copper-lead separation and separate zinc flotation from the bulk flotation tails.

As described in the lead-zinc ore processing section, zinc sulphate and metabisulphide sphalerite and pyrite depressants, respectively, are typically added to grinding. Then a Cu-Pb bulk concentrate is recovered with xanthate, dithiophosphate and flotation reagent blends. Collector selection in the bulk flotation step must consider impact on the subsequent Cu-Pb separation stage where a stronger collector may not be well tolerated. Generally the lead mineral, typically galena, readily floats and optimum collector selection for copper will provide good lead recoveries. In some cases, maximizing bulk copper recovery may require use of thiocarbamate and thionocarbamate collectors in conjunction with dithiophosphate and xanthate chemistries in bulk flotation. The zinc reporting to the bulk flotation tails feeds the zinc circuit which is operated as previously described in the lead-zinc flotation section.

Which flotation scheme used in the differential copper-lead bulk concentrate separation is generally and often dependent upon which mineral has the greater mass in the bulk concentrate. Whichever mineral constitutes the lower bulk concentrate mass will be floated away from the other mineral which is depressed for flotation selectivity reasons. Other factors related to the specific copper and lead mineral processing characteristics must be considered when deciding on which copper or lead mineral will be floated from the other, for instance relative mineral flotation kinetics.

The subsequent Cu-Pb separation flotation step is usually conducted at alkaline pH regardless. In most cases, lime is used as a pyrite depressant but some operations prefer soda ash because lime tends to depress precious metals. As described in the lead-zinc process description, in some instances enhanced iron sulphide depression can be improved by aeration prior to the differential Cu-Pb flotation step.

Most often the copper minerals are floated after galena depression. Galena is depressed using sodium dichromate, sodium sulfite, polysaccharide (starch, dextrin) or even CMC. Addition rates of these depressants can be critical if any recirculating load is returned to the bulk rougher circuit. This flotation step is conducted at alkaline pH. In the case where galena is floated and the copper minerals are depressed, copper depression can be achieved by using sodium sulphide, hydrosulfite, lime, cyanide, zinc-cyanide and/or ferricyanide complexes.

Selection of flotation reagents and frothers is an important, even critical, consideration. The mineralogy, circuit configuration and process step goals must be accounted when selecting the flotation reagents.

The following Danafloat™ collectors should be initially considered for complex Cu-Pb-Zn ore flotation:

Cu-Pb Flotation:

Danafloat™ 067
Danafloat™ 068
Danafloat™ 070
Danafloat™ 233
Danafloat™ 245
Danafloat™ 345
Danafloat™ 507E
Danafloat™ 271 and 571 for oxidized copper and lead minerals.

Selective Zn Float:

Danafloat™ 123
Danafloat™ 233
Danafloat™ 468
Danafloat™ 245
Danafloat™ 271
Danafloat™ 571

CHEMINOVA DANAFLOAT™