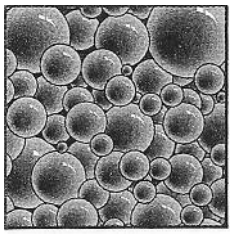
Hollow Microspheres



Technical Tips

Oil Absorption: A Lesson in Economical Fillers

The term “Oil Absorption” is commonly used in describing filler performance in several industries. Although some fillers absorb some resin during formulation, as it applies to microspheres and some other non-porous particles, it might be misunderstood. It does not mean that oil (resin) or other liquid are actually entering the individual particles. Rather, it refers to filling of the air spaces between the particles.

Absorption rates may be predicted through an oil absorption test[1], which measures the degree to which fillers are "wet out." High values indicate that a filler will require more resin to produce an acceptable composite and the composite therefore will be more expensive.

Table 1: Oil Absorption Rates

Filler Type	Oil Absorption Per 100 g	Oil Absorption Per 100 ml
Q-CEL® 6014	217	33
Q-CEL® 6019	149	30
Q-CEL® 6048	71	34
SPHERICEL ® 110P8	38	42
Z-CEL®	22	48
“Ceramic Microsphere”	34	82
Nepheline Syenite	27	70
Calcium Carbonate	20	56
Talc	54	151

NOTE: Oil absorption rates for microspheres, calcium carbonate and talc on volume basis are shown in Table 1. Oil adsorption rates usually are based on grams of oil absorbed per 100 grams filler.
(Re: ASTM D 281: Oil Absorption of Pigments by Spatula Rub-out). Testing by weight was an accepted way of comparing heavy mineral fillers to each other. This measure, however, is a misleading indicator for hollow microspheres. Because of the hollow microspheres' low density, which ranges from 0.14 - 1.1 g/cm^3, a far larger volume of microspheres are required to equal 100 grams. In actual formulations, equivalent volumes of microspheres should be used in place of conventional fillers as a starting point. Usually higher loading are possible for improved economics. Replacing conventional fillers with an equal weight of micro spheres is misleading and would not yield an acceptable product.[2]

When measured on a volume basis, calcium carbonate absorbs 1.9 times more oil per milliliter of filler than Q-CEL® 6019 hollow glass microspheres, and talc absorbs 5 times more oil.

SPHERICEL® and Z-CEL® have a bit higher oil absorption than the larger Q-CEL® range of microspheres but have superior performance compared to mineral fillers and competitive products that claim to be spherical.

[1] Oil Absorption of Pigments by the Gardner-Coleman method, ASTM D 1483, is preferred over the similar Oil Absorption of Pigments by Spatula Rub Out, ASTM D 281.

[2] On an equal basis, hollow microspheres typically have 5 to 15 times more volume than heavy weight fillers, such as calcium carbonate and talc. The volume of microspheres is a more reliable measure since most compositions such as coating and composites are used on a volume basis.

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