Polymer clays are made up of a mixture of polyvinyl chloride and a phthalate ester. Curing of the finished clay product requires heating at a controlled temperature (130-135°C or 265-275°F). Potential exposures may occur from the accidental ingestion of the product, from skin contact during the production steps and during incidental food contact from materials released during baking. Over heating of polymer clays can result in breakdown of the clay with release of hydrogen chloride gas.

**Toxicity Concerns**

Phthalate esters are used in polymer clays have a low order of acute toxicity with ingestion or skin contact with no lethalities occurring at maximum doses (up to >20 g/kg orally and >5 g/kg by skin contact). Testing for skin irritation and sensitization of these esters has been negative.

Phthalate esters used in polymer clays are metabolized to mono-phthalates in the intestine. The mono-phthalates act similar to fatty acids causing excessive triglyceride synthesis in the liver with high level dosing. Subacute or chronic dosing with these phthalates leads to mild liver changes one would see with ingestion of alcohol and a high fat diet. Acute high level or chronic dosing with some or these phthalate esters can cause testicular atrophy, decreases reproductive performance, and fetal effects at high doses. These phthalate esters are not mutagenic.

The major route for absorption of these phthalate esters is by ingestion. Appreciable absorption via skin is unlikely. These phthalates are poorly absorbed through the skin with absorption rates ranging from 0.002 to 0.05% per hour.
Potential risks from baking polymer clays

The Consumer Product Safety Commission (CPSC) has extensively tested samples of polymer clay for safety concerns. Testing included analyses of clay extracts by gas chromatography/mass spectroscopy and analysis of gas release with heating. They found that the polymer clay tested did not contain any volatile organic compounds and that no acid gases were released if the clay was baked to 163° C (325° F). They found that hydrogen gas was released once the clay was heated to the point of turning black, 180° C (356° F).

Polymer clays are hardened by heating in an oven at a temperature of 265-275° F. At this temperature, there is no evidence of breakdown of these clays. With over heating to temperatures as high as 375° F, <0.1% of the phthalate esters were released and no breakdown of the polyvinyl chloride occurs. At higher temperatures, above 390° F, the clay blackens releasing hydrogen chloride gas. These laboratory results were compared with a heavy use situation by wiping the interior of the oven and analyzing the wipes for phthalate esters. Over heating had occurred at least once. Less than 0.01% of the phthalate esters present were released.

We presume that an individual will ingest 24 mg of clay a day through incidental contact. Additional exposure from accidental release of phthalate esters during curing would add little to the base exposure presumption for these clays, even assuming concurrent use of the oven to bake foods.

In summary, phthalate esters found in these polymer clays offer little or no acute toxicity concerns and are not a chronic hazard concern even assuming a large (24 mg) daily ingestion of these clays. The manipulation of these clays will not increase the likelihood of absorbing phthalate esters. Analyses of these clays for residual vinyl chloride find non-detectable (<1 ppm) levels. The clay matrix does not break down to release hydrogen chloride gas until temperatures of greater than 350° F. are reached. Curing at temperatures low enough to prevent destruction of the clay body will prevent appreciable hydrogen chloride gas or phthalate ester release.

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