Mineralogy and paragenesis of "pocket" clays, and associated minerals in complex granitic pegmatites, San Diego County, California

Foord, et al.

To be deposited: Table 1

American Mineralogist, 71 3-4, 428-439
Table 1. Samples of "pocket" clays and other minerals examined from the Himalaya and San Diego mines (39 samples), Mesa Grande District; the Little Three Mine (4 samples) Ramona District; the Ocean View, Katrina, White Queen, and Tourmaline Queen mines (9 samples), Pala District; and the Maple Lode mine (1 sample), Aguanga Mountain.

<table>
<thead>
<tr>
<th>Sample number</th>
<th>Location and description</th>
<th>Minerals identified and amounts present (all amounts given as parts in 10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDTM-0*</td>
<td>San Diego Tourmaline Mine, Mesa Grande District</td>
<td>quartz  trace, mica &lt;1, cookeite &lt;1, montmorillonite &lt;1, or heidellite trace, Li-tosudite 8+</td>
</tr>
<tr>
<td></td>
<td>Waxy, overall light pink clay. Some minor brown-black manganese oxides. About 2% of clay is vivid pink-red, and waxy. Also traces of white clay. 1-2% laumontite present in cavities. Pocket-filling.</td>
<td>illite trace, montmorillonite trace, pollucite 9+</td>
</tr>
<tr>
<td>SDTM-1</td>
<td>White, granular, friable pollucite with some white clay. Veinlets of cross-cutting quartz. Pocket-filling.</td>
<td>montmorillonite 1, laumontite 9</td>
</tr>
<tr>
<td>SDTM-2</td>
<td>Crystalline, white laumontite, to 4 mm in length. Cross-cut by a network of lepidolite. Fine-grained, buff clay fills interstices. Pocket-filling.</td>
<td>montmorillonite 9+, pollucite trace</td>
</tr>
<tr>
<td>SDTM-3</td>
<td>Fine-grained, white to light pink clay. Traces of relict, granular, clear pollucite. Pocket-filling.</td>
<td>montmorillonite 9+, pollucite trace</td>
</tr>
<tr>
<td>SDTM-4</td>
<td>Massive, radiating aggregates of white stilbite coated with pale pink montmorillonite; pocket-filling.</td>
<td>stilbite 9+, montmorillonite &lt;1</td>
</tr>
<tr>
<td>SDTM-5*</td>
<td>Nearly identical in appearance to SDTM-0.</td>
<td>illite 1, cookeite trace, montmorillonite trace?, Li-tosudite 8+</td>
</tr>
<tr>
<td>SDTM-2EV</td>
<td>Pale-pink, pocket-filling clay.</td>
<td>quartz trace, K-feldspar 2+, laumontite trace, montmorillonite 7</td>
</tr>
<tr>
<td>Location</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>----------</td>
<td>-------------</td>
<td></td>
</tr>
<tr>
<td>SDTM-2EJ</td>
<td>Pink and white pocket-filling clay. Contains fragments of tourmaline, mica, quartz, etc. White and pink clays about 50% each.</td>
<td></td>
</tr>
<tr>
<td>SDTM-3a</td>
<td>Mixture of white clay and red-brown, sticky clay; pocket-filling.</td>
<td></td>
</tr>
<tr>
<td>SDTM-4c</td>
<td>Dark brown, waxy clay; pellets and masses; pocket-filling.</td>
<td></td>
</tr>
<tr>
<td>SDTM-5</td>
<td>White pocket-filling, containing fragmented primary pocket minerals such as quartz, elbaite, feldspar, and others.</td>
<td></td>
</tr>
<tr>
<td>SDTM-5E</td>
<td>Pseudomorph of white alteration minerals after beryl. Assoc. albite.</td>
<td></td>
</tr>
<tr>
<td>SDTM-6E</td>
<td>White, fibrous &quot;mountain-leather&quot; with coatings of later red-brown (Fe-stained) kaolinite. Pocket-filling.</td>
<td></td>
</tr>
<tr>
<td>EEF-75-21</td>
<td>Massive, white-buff laumontite and montmorillonite speckled with tiny fragments of muscovite. Pocket-filling</td>
<td></td>
</tr>
<tr>
<td>EEF-75-16*</td>
<td>Compact, tan-buff, waxy clay, pseudomorphous after elbaite with some assoc. lepidolite. From 'pink area', lower incline, pocket-filling.</td>
<td></td>
</tr>
</tbody>
</table>
SDTM-1974Pol* White, granular clay with assoc. pale pink clay, from the "pit" in the "pink area", (lower level incline before it was finished). Pocket-filling. 

**Pink clay**
- beidellite 9+
- albite trace
- stilbite trace
- white clay
- pollucite 4+
- montmorillonite 2+
- kaolinite 2+
- quartz trace
- cookeite trace
- lepidolite trace


- albite 1
- montmorillonite 4
- laumontite 5

SDTM-A Shattered primary pocket minerals including quartz, pink elbaite, feldspars, and lepidolite; cemented by pale pink montmorillonite.

- quartz trace
- K-feldspar 4+
- mica 1
- montmorillonite 4

SDTM-B Fragments of green and pink elbaite and feldspars, coated and enclosed within white, fine-grained, massive to radiating, fibrous masses of bavenite. Bavenite is cellular and filled with red-brown kaolinite. Portion of pocket contents.

- albite trace
- bavenite 7+
- elbaite 2

SDTM-1972AT Elbaite crystals, pink with light green caps, being replaced by purple lepidolite. Green caps are much less susceptible to replacement and corrosion than pink elbaite. Portion of pocket contents.

- lepidolite 6
- elbaite 4

SDTM-1975WP* White, fine-grained "pocket" clay, including fragments of pink and green elbaite, quartz and feldspars.

- montmorillonite 9+
- lepidolite <1

SDTM-1975pp* Pale pink granular, homogeneous "pocket" clay. Aggregate of clays, micas, zeolites, etc. Includes broken fragments of pink elbaite and some manganese oxide veinlets.

- beidellite 10
SDTM-1975-24.8* Shattered primary pocket minerals, filled and incorporated within pale pink clay.

SDTM-1984-12 White, flattened, dried masses of "mountain leather", stained by Fe and Mn oxides. Pocket-filling.

SDTM-Tod Black, sooty, pelletal, 1-2 mm, masses coating feldspar and quartz in a pocket.

Himalaya Mine, Mesa Grande District

Him-1 Pure white, granular pocket-filling clay with some zeolite.

Him-2 Deep green elbaite crystal coated with buff-cream felted masses of fine-grained needles. Pocket-crystal.

Him-3 Cavernous, etched pink-purple lepidolite coated on one surface with white, fine-grained sparkling coating 0.5 to 1 mm thick. Traces of manganese oxides. From a pocket.

Him-4 Purple lepidolite pseudo-hexagonal "barrels" 4-5 mm across, and 8 mm long, coating pink elbaite. White, pearly cookeite coats the lepidolite. From a pocket.

Him-5 Fine-grained 0.5 to 1.0 mm thick coating of mica on corroded and etched elbaite. Pink portion is skeletal while green cap is unattacked. Pocket material.

Him-6 Red-brown, late "pocket" clay coating quartz crystals.

Him-7 Fragmented smoky quartz, microcline, lepidolite and albite cemented together and coated by pearly cookeite. Pocket material.

Him-8 Dried and cracked buff-tan "pocket" clay on platy calcite, quartz, pink elbaite, albite, etc.
Him-9* Microcline crystal fragment coated with pearly cookeite. Pocket material. microcline 1+ cookeite 8+

Him-10* Massive, white, elastic "pocket" clay coated with Fe-stained kaolinite. palygorskite 10

Him-11 Red-brown kaolinite on top of palygorskite in pocket. kaolinite 9+

Him-12 Fine grained white-cream sanidine(?)-orthoclase coating on top of microcline perthite. Coating is 1 to 6 mm thick. Pocket material. K-feldspar 6+ albite 3+

Him-13 Pale pink, pure "pocket" clay, from 1984 workings. montmorillonite or beidellite 10

Him-14 laumontite; white, granular, hard pocket-filling. Assoc. with quartz and pink elbaite. laumontite 10

Little Three Mine, Ramona district

F-2 Fragmented pocket feldspars cemented by tan-brownish gray clay. Hercules workings. albite 5 microcline 2+ muscovite trace kaolinite <1 montmorillonite 1+

F-1P Vivid pink clay coating large lepidolite "books". June, 1976 Spaulding pocket in Main dike. montmorillonite 9+ fluorapatite trace

F-1W White, hard porcellaneous coating containing fragments of primary minerals coating lepidolite, blue topaz, and other pocket floor minerals. Spaulding pocket in Main dike. high boron-containing K-feldspar(?) 8 quartz 1 lepidolite tr

LT-T Olive green elbaite crystal coated with buff-cream fine-grained "clay". This crystal was on the roof of the pocket but was broken off and fell to the bottom before deposition of the white-buff "snow on the roof" coating. Spaulding pocket in Main dike.

orthoclase(?) 7+
albite 1+
mica 1+
Ocean View (Eliz. R) Mine, Pala district

OV-1 Red-brown clay taken from a 1 m wide pocket containing quartz, muscovite and feldspar; many large roots. Nearby large fractures in pegmatite. Located just west of "spodumene column".


OV-3 Light reddish-brown "pocket" clay taken from crack near base that ran into a layer of lepidolite. Approx. 7 meters in from south entrance of mine.

OV-4 Altered spodumene from "spodumene column", west side. Many roots nearby, also more Mn? staining than other samples. Light pink-cream.

OV-5 Altered spodumene from "spodumene column", south side. Light pink, sporadic dark staining.

Katrina Mine, Pala district

K-P* Pseudomorphous purplish-red "pocket" clay, intermixed with white clay and clear relict fragments of kunzite. Some dendrites and patches of black manganese oxides present. Pink material is about 30% of total white and pink clay.

K-W* Same as for K-P. Replacement has proceeded along cleavages and c direction of kunzite. White clay shells are immediately around the spodumene. Purple-red clay is infilling.

White Queen Mine, Pala district

WQ-1 Vivid red-purple "pocket" clay with some manganese oxide coating quartz.
Tourmaline Queen Mine, Pala district

TQ-1
Deep red-brown "pocket" clay with kaolinite fragments of primary minerals, quartz principally quartz.

Maple Lode Mine, Aguanga Mountain district

ML-1
Lepidolite, indicolite to albitite, achoite tourmaline and feldspars lepidolite coated with a white, fine-grained K-feldspar material. Other samples have stilbite etc. coating primary minerals. Pocket material.

Notes— Exact locations for all but the Maple Lode mine are given in Foord (1976) and Jahns and Wright (1951). On heating to 400°C, this montmorillonite collapses to a d₀₀₁ spacing of 9.2A, which is much lower than the expected 9.8A spacing. The reason for this lower spacing has not yet been determined. *Chemical analysis of clay given in Table 3.