

Appendix 6: Petrographic Characteristics of Lithologies in the North Verde Volcanic Field

Verde Alkaline Series

Phaneritic Rocks	
<p style="text-align: center;">nepheline monzosyenite</p> <p>plagioclase (An₆₂-An₂₀). anorthoclase; discrete crystals and mantles on plagioclase. sanidine; mantles on anorthoclase, interstitial, and euhedral in miarolitic cavities. nepheline; euhedral to subhedral. analcime. clinopyroxene; violet-tan Ti-augite zoned to aegirine-augite to acmite rims. biotite; reaction rims on opaque oxide. olivine; skeletal. brown amphibole; euhedral prisms. opaque oxide; skeletal. apatite; abundant needles in symplectite nepheline. miarolitic cavities containing zeolite, carbonate, analcime, sanidine. nepheline--Ti-augite symplectite. nepheline--Na-plagioclase--anorthoclase symplectite. hypidiomorphic granular.</p>	<p style="text-align: center;">nepheline monzodiorite</p> <p>plagioclase (An₇₂₋₅₅); subhedral laths to poikilitic. anorthoclase; mantles on plagioclase. sanidine; mantles on anorthoclase and euhedral in miarolitic cavities. nepheline; euhedral to subhedral. analcime. sodalite; clear, colorless; may be absent. clinopyroxene; violet-tan blocky prisms, small green prisms; zoning: violet-tan—green—yellow. olivine; mantled by amphibole; may be absent. brown amphibole; slender prisms. biotite; discrete plates and rims on opaque oxide. opaque oxide; euhedral to skeletal. zeolite; in miarolitic cavities. carbonate; sparse or absent. sphene. apatite; stout prisms and needles. nepheline—Ti-augite symplectite. hypidiomorphic granular. local pressure-quenched aplitic-like patches.</p>
<p style="text-align: center;">syenitic urtite</p> <p>Na-plagioclase. anorthoclase. sanidine. nepheline. clinopyroxene; Ti-augite zoned to aegirine-augite to acmite rims. opaque oxide. apatite. miarolitic cavities containing zeolite (chabazite, natrolite), carbonate, sanidine. nepheline--Na-plagioclase symplectite. hypidiomorphic granular.</p>	<p style="text-align: center;">feldspar ijolite</p> <p>plagioclase (An₅₂₋₄₀). anorthoclase; mantles on plagioclase. sanidine; mantles on anorthoclase and euhedral in cavities. nepheline; euhedral. clinopyroxene; Ti-augite zoned to aegirine-augite to acmite rims. brown amphibole; rims on clinopyroxene. olivine; skeletal. biotite; rims on opaque oxide and olivine. apatite; abundant needles in symplectite nepheline. miarolitic cavities with zeolite, carbonate, sanidine. nepheline—Ti-augite symplectite. hypidiomorphic granular.</p>

Verde Alkaline Series	
<u>Aphanitic Rocks</u>	
<p style="text-align: center;">basanitic nephelinite</p> <p>phenocrysts: olivine>>clinopyroxene. matrix: clinopyroxene; very abundant prisms. olivine. nepheline; interstitial to poikilitic crystals. plagioclase (An₆₉₋₄₀); microlites to poikilitic crystals. alkali feldspar; mantles on plagioclase. opaque oxide. biotite; small scraps and poikilitic crystals. apatite; stout prisms to abundant needles. trachytoid to massive.</p>	<p style="text-align: center;">alkali basalt</p> <p>phenocrysts: olivine; euhedral. clinopyroxene; sparse blocky prisms. matrix: clinopyroxene; abundant slender prisms. olivine. plagioclase; microlites. alkali feldspar; rims on plagioclase. biotite; sparse small scraps. analcime; sparse. opaque oxide. apatite; needles. trachytoid.</p>
<p style="text-align: center;">monchiquite</p> <p>phenocrysts: olivine; euhedral; altered to phyllosilicates. clinopyroxene; green blocky prisms, yellow slender prisms. biotite; altered to magnetite pseudomorphs. matrix: clinopyroxene; abundant slender prisms. olivine. plagioclase; poikilitic. analcime; poikilitic. hauyne; euhedral, clear. opaque oxide. apatite; stout prisms. zeolite; in vesicles.</p>	<p style="text-align: center;">alkali mugearite</p> <p>phenocrysts: olivine; euhedral. clinopyroxene; euhedral slender prisms. brown amphibole; kaersutite? matrix: clinopyroxene. olivine. plagioclase; microlites. alkali feldspar; interstitial and rims on plagioclase. biotite. opaque oxide. apatite; stout prisms, pleochroic.</p>
<p style="text-align: center;">basanite</p> <p>phenocrysts: olivine; small euhedral, larger embayed with brown spinel inclusions. clinopyroxene; blocky prisms, pale green rosettes. matrix: clinopyroxene; abundant. olivine. plagioclase (An₆₁); microlites, subpoikilitic. nepheline; poikilitic. analcime; poikilitic. hauyne; euhedral, clear and radial inclusions, may be absent. biotite; small scraps and poikilitic plates. opaque oxide. apatite; abundant needles. holocrystalline.</p>	

Verde Transitional Series

Phaneritic Rocks	
<p style="text-align: center;">monzonite</p> <p>plagioclase (An₄₀-An₃₅ cores to An₁₂₋₁₀ rims) anorthoclase; fine tartan twins, mantles on plagioclase. clinopyroxene; light green and yellow to yellowish brown. olivine. brown amphibole; discrete crystals and reaction rims on clinopyroxene. biotite. opaque oxide, apatite. hypidiomorphic, granular.</p>	<p style="text-align: center;">syenite</p> <p>plagioclase (An₄₀₋₃₄ cores to An₁₆₋₉ rims). anorthoclase; fine tartan twins, discrete crystals, and mantles on plagioclase. sanidine; discrete crystals, and mantles on plagioclase and anorthoclase. clinopyroxene; light green to medium greenish yellow to yellow to yellowish brown. biotite. brown amphibole. opaque oxide; apatite. hypidiomorphic to idiomorphic granular. diktytaxitic.</p>
<p style="text-align: center;">monzodiorite</p> <p>plagioclase (An₄₅-An₄₀ cores to An₁₂ rims). alkali feldspar; interstitial, and mantles on plagioclase. sanidine; euhedral crystals associated with interstitial zeolite. clinopyroxene; light green. olivine. brown amphibole; discrete crystals, and reaction rims on clinopyroxene. biotite; discrete crystals, and reaction rims on olivine and opaque oxide. opaque oxide. apatite. hypidiomorphic, granular.</p>	<p style="text-align: center;">nepheline-bearing syenite</p> <p>plagioclase (An₂₀). anorthoclase; discrete crystals, and mantles on plagioclase. sanidine; mantles on anorthoclase, and discrete euhedral to interstitial crystals. nepheline; euhedral to interstitial crystals (5%). brown amphibole. biotite. clinopyroxene; pale tan, zoned to pale to medium green and yellow. opaque oxide. apatite. sphene. zeolite; interstitial. hypidiomorphic, granular.</p>
<p style="text-align: center;">microdiorite</p> <p>phenocrysts: olivine. clinopyroxene; green. plagioclase. matrix: plagioclase (An₄₀₋₉). alkali feldspar; interstitial. clinopyroxene; green. brown hornblende; rims on clinopyroxene. biotite; small scraps and poikilitic crystals. opaque oxide. apatite. hypidiomorphic, microcrystalline.</p>	<p style="text-align: center;">foid monzodiorite</p> <p>plagioclase; slender laths. anorthoclase; interstitial and mantles on plagioclase. sanidine; interstitial. analcime; interstitial. nepheline; euhedral. clinopyroxene; violet-tan to yellowish green. olivine; may be absent. biotite; small plates. brown amphibole; may be absent. opaque oxide; euhedral to skeletal. zeolite; interstitial. carbonate; may be absent. apatite; slender prisms.</p>

Verde Transitional Series	
Aphanitic Rocks	
<p style="text-align: center;">basalt</p> <p>phenocrysts: olivine; euhedral to embayed. clinopyroxene; euhedral stout prisms, pale green rosettes.</p> <p>matrix: plagioclase (An₆₁₋₄₀); microlites. clinopyroxene; euhedral slender prisms. olivine. biotite; small scraps. alkali feldspar; interstitial and rims on plagioclase. analcime; interstitial, may be absent. opaque oxide. apatite; needles. intergranular.</p>	<p style="text-align: center;">shoshonite</p> <p>phenocrysts: clinopyroxene; pale green prisms. plagioclase (An₆₈); euhedral laths. brown amphibole; may be absent. olivine; may be absent. opaque oxide.</p> <p>matrix: plagioclase (An₄₅). clinopyroxene; pale green. biotite; small scraps; may be absent. alkali feldspar; interstitial and rims on plagioclase. olivine; may be absent. opaque oxide. apatite; brownish. microcrystalline; felty to intergranular.</p>
<p style="text-align: center;">hawaiite</p> <p>phenocrysts: olivine. plagioclase; rare.</p> <p>matrix: olivine; abundant. clinopyroxene; slender prisms. plagioclase; microlites. biotite; fresh scraps to small poikilitic crystals. alkali feldspar in interstitial patches, and mantles on plagioclase microlites. brown amphibole; may be absent. opaque oxide. microcrystalline in lavas and dikes.</p>	<p style="text-align: center;">hornblende mugearite</p> <p>phenocrysts: brown amphibole. clinopyroxene. plagioclase.</p> <p>matrix: olivine; sparse to absent. biotite; sparse to absent. clinopyroxene; stubby to slender prisms. plagioclase; microlites. alkali feldspar; interstitial, and mantles on plagioclase. opaque oxide. biotite; sublimate in vesicles. intergranular in lavas; hypidiomorphic in dikes</p>
<p style="text-align: center;">pyroxene mugearite</p> <p>phenocrysts: clinopyroxene > olivine. plagioclase present or absent; when present, plag>cpx>>ol.</p> <p>matrix: olivine; abundant to scattered. clinopyroxene; stubby and slender prisms. plagioclase; microlites. biotite; anhedral scraps to small poikilitic crystals. alkali feldspar; interstitial, and mantles on plagioclase. opaque oxide. biotite; sublimate in vesicles. intergranular in lavas. intergranular to hypidiomorphic in dikes.</p>	<p style="text-align: center;">benmoreite</p> <p>phenocrysts: brown amphibole. clinopyroxene. plagioclase.</p> <p>matrix: very felsic. plagioclase microlites. olivine. clinopyroxene; stubby to slender prisms. biotite is absent (?). alkali feldspar; interstitial, and mantles on plagioclase. opaque oxide. sublimate biotite, aegirine(?), and cummingtonite (?) in vesicles. trachytic in lavas and dikes.</p>

Verde Subalkaline Series

<u>Phaneritic Rocks</u>	
<p style="text-align: center;">quartz monzonite</p> <p>plagioclase (An₃₀-An₂₃). anorthoclase; fine tartan twins, mantles on plagioclase. sanidine; discrete crystals; sparse. tridymite; abundant. clinopyroxene. brown amphibole. biotite. olivine. opaque oxide. apatite. intergranular.</p>	
<u>Aphanitic Rocks</u>	
<p style="text-align: center;">quartz subalkali basalt</p> <p>phenocrysts: olivine. matrix: olivine. clinopyroxene; slender prisms. plagioclase; microlites. opaque oxide. tridymite; sublimate. intersertal to hyalophitic. biotite is absent.</p>	<p style="text-align: center;">subalkali basalt</p> <p>phenocrysts: olivine; euhedral to embayed. matrix: plagioclase; slender laths. clinopyroxene; small blocky prisms. olivine. alkali feldspar; interstitial. opaque oxide. intergranular.</p>
	<p style="text-align: center;">basaltic andesite</p> <p>phenocrysts: olivine; may have reaction rims of orthopyroxene in dikes. clinopyroxene; sparse to absent. plagioclase; absent in lavas and local in dikes. orthopyroxene; absent in lavas and rare in dikes. matrix: olivine; moderately abundant to absent. plagioclase; microlites. clinopyroxene; stubby prisms, (2Vγ = 45°-55°). pigeonite; sparse(?), (2Vγ = 15°-20°). orthopyroxene; rare(?) (2Vα > 60°), stout prisms and poikilitic crystals in ophitic texture with plagioclase microlites. biotite and amphibole; absent in lavas, rare in dikes. biotite; reaction rims on opaque oxide in dikes. alkali feldspar; absent in lavas; may be present in dikes. opaque oxide. intersertal to intergranular in lavas and dikes.</p>

Miscellaneous

<p style="text-align: center;">camptonite</p> <p>phenocrysts: clinopyroxene; pale green blocky to slender prisms. plagioclase; blocky euhedral to subhedral crystals. biotite; euhedral plates, sieve texture. olivine; sparse.</p> <p>matrix: plagioclase; microlites to blocky, subhedral to anhedral. clinopyroxene; euhedral slender prisms. biotite; poikilitic plates. olivine; euhedral. brown amphibole. analcime; poikilitic, "spots" on weathered surfaces. carbonate. apatite; stout prisms.</p>	
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