

| <u>Rock</u><br><i>(German)</i> | <u>Sedimentary Rock</u> | <u>Clastic</u> | <u>Claystone/Mudstone</u>         |                             |  |   |
|--------------------------------|-------------------------|----------------|-----------------------------------|-----------------------------|--|---|
| <u>R - A</u>                   |                         |                | <u>Sandstones</u>                 | <u>Sandstone</u>            | > 90 % grains of Quartz (SiO <sub>2</sub> )<br>For some very durable and hard sandstones, mostly with quartzitic cementation, Quarzite is used as trivial name. Real Quarzites however are metamorphic!  | Elbsandsteingebirge, Odenwald, Pfälzer Wald, Moab (Utah)<br><br><u>R - A</u>  |
|                                |                         |                |                                   | <u>Arkose</u>               | > 25 % Feldspar<br>molasse sedimentation within continents   | Fountain Formation (Colorado), Uluru (Australia)<br><br><u>R - A</u>  |
|                                |                         |                |                                   | <u>Greywacke</u>            | material similar Arkose, but > 15 % matrix and marine sedimentation  | Thüringer Wald<br><br><u>R - A</u>  |
|                                |                         |                |                                   | <u>(Gritstone)</u>          | rounded grains, mostly quartz and feldspar, 1-4 mm. Most of them would fit in sandstones-rock group, some are slightly conglomeratic. However possibly grains up to 4 mm. Definition of Sandstone ends up at 2 mm.<br>(After all local and/or special English rock name.)  | Peak District (England)<br><br><u>R - A</u>   |
|                                |                         |                | <u>Conglomerates and Breccias</u> | <u>Conglomerate</u>         | > 50 % rounded grains and clasts > 2 mm up to >> 63 mm in fine matrix  | Meteora (Greece)<br>Uluru (Australia)<br><br><u>R - A</u>   |
|                                |                         |                |                                   | <u>Breccia</u>              | > 50 % broken and sharp edged grains and clasts > 2 mm up to >> 63 mm in fine matrix. Volcanic breccias are listed under "Igneous" (-> "Breccia"). However could be classified as sediments, too.  | Innsbruck<br><br><u>R - A</u>   |
|                                |                         |                | <u>Chemical and Biochemical</u>   | <u>Carbonates</u>           | <u>Limestone</u><br><br>CaCO <sub>3</sub><br><br>Special types:<br>- <u>Tufa</u><br>- <u>Chalk</u><br>- <u>Calcareous sinter</u>   | Fränkische Alb,<br>Wetterstein, Marmolada,<br>Karwendelgebirge<br>(E.g. Laliderer Wände)<br><br>Special:<br>Switzerland<br>Kent/England<br>Greece,<br>Italy<br><br><u>R - A</u> |
|                                |                         |                |                                   | <u>Dolomite / Dolostone</u> | 90 % CaMg(CO <sub>3</sub> ) <sub>2</sub><br>harder and more brittle than limestone   | Fränkische Alb,<br>Wetterstein,<br><u>Dolomites</u> (Rosengarten, Schlern, etc.. - Latemar, Marmolada however constist of limestone!)<br><br><u>R - A</u>                       |
|                                |                         |                |                                   | <u>Chert</u>                | Chert is a special rock consisting of quartz (SiO <sub>2</sub> ). Bigger layers which would allow climbing in most cases are originating in former bionic quartz skeleton remains of deep marine organisms (e.g. Radiolarite).<br><br>In a special case (*) underwater 'hydrothermal' activity might result in sedimentary cherts, too, which however than is quite different of normal hydrothermal 'Quartz'.<br><br>(*): hot spring chert deposit, 'Deseado Massif', Patagonia | Gunflint Chert, (Ontario), Rhynie Cherts (Scotland), Bitter Springs Formation (Amadeus Basin, Australia)<br>Apex Chert (Pilbara, Australia)<br><br><u>R - A</u>                 |
|                                |                         |                |                                   | <u>Evaporites</u>           | Halite, Gypsum, Anhydrite  |   |

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| <p><i>(German)</i></p> <p><b>Metamorphic Rocks</b></p> <p>R - A</p> | <b>Gneiss</b>                       |  | Bayerischer Wald,<br>Schwarzwald,<br>Alps               | Kaitersberg<br>Todtnau<br><a href="#">R - A</a>   |
|   | <b>Schist</b>                       | > 50 % mica  | Alps  | Marchegg<br><a href="#">R - A</a>   |
|   | <b>Marble</b>                       | metamorphically altered sedimentary carbonates<br><br>'Marble' is used for a lot of quite normal Carbonates respectively their products, and even for some Serpentinites and Granits, too. However, under petrographic point of view Marbles in general are carbonatic metamorphic rocks only! | Südtirol,<br>Carrara (Italy),<br>Thassos (Greece)       | Nesselwand (Laas,<br>Südtirol)<br><br><a href="#">R - A</a>   |
|   | <b>Quarzite</b>                     | > 98 %.Quartz (SiO <sub>2</sub> ) and metamorphic (!) Do not mix up with simply tough "Sandstones" and "Hydrothermal and Metasomatic" "Quartz" or even "Chert"!  | Hundsrück<br><b>Kalpetranquarzit</b><br>(Wallis)        | Kirner Dolomiten<br>(Hundsrück), Medij<br>(Mattertal, Schweiz)<br><br><a href="#">R - A</a>   |
|   | <b>Serpentinite</b>                 | mostly metamorphically altered peridotite from former deeper oceanic crust<br>former subduction zones and oceanic crust  | Granatspitzgruppe,<br>Umbaltal (Osttirol),<br>Steinwald | Blauspitze<br><br><a href="#">R - A</a>   |
|   | <b>Amphibolite</b>                  | mostly metamorphically altered Gabbro<br>E.g. within all <a href="#">varistic orogens</a>  | Alps  | Kühstein (Steinwald),<br>Großes Grünhorn<br>(Schweiz)<br><br><a href="#">R - A</a>  |
|   | <b>Greenschist and Prasinite</b>    | Very broad range of completely different looking rock types.<br>However all containing lots of green minerals! Originally mostly former mafic volcanic rocks. (Not all are durable enough for climbing.)   | Taunus<br>Alps  | Lorsbacher Wand<br>Großglockner<br><br><a href="#">R - A</a>  |
|   | <b>Hornfels</b>                     | At 600-700° completely recrystallised minerals (not molten!) and thus mostly very tough. Broad range, depending on educt.  | Harz,<br>Alps   | Radautal<br>Seebichl-Kraig<br><br><a href="#">R - A</a>   |
|   | <b>Slate</b>                        | very first step of metamorphism of very finegrained (< 0,002 mm) sediments   | Thüringen   | Spiegelwand<br><br><a href="#">R - A</a>  |
|   | <b>Migmatite</b>                    | partly remolten rock   | Schwarzwald<br>Norway,<br>Brasil,<br>India              | Gfällfelsen<br><br><a href="#">R - A</a>  |
|   | <b>Diabas/Grünstein</b><br>(German) | In German Diabas is a traditional designation for some sorts of geologically 'old' and thus slightly metamorphous altered 'green' basalts. The English "Diabase" is a different basaltic igneous rock (Dolerite)!  | Thüringen/Sachsen<br>Frankenwald                        | Steinicht<br>Selbitztal<br><br>Thecrag-tagged under <b>Basalt</b> as metamorphism is very low grade only and most textures basaltic |

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| <b>(German)</b> | <b>Igneous Rock</b> | <b>Plutonic<br/>(Intrusive rocks)</b><br><br>Solidified > 5 km depth | <b>Peridotite</b>  |                     | mostly olivin (< 40 %), pyroxen   | Val Malenco (Italy)   | Val Malenco<br><a href="#">R - A</a>                                   |
|                 |                     |  | <b>Gabbro</b>  |                     |   | Harz,<br>Odenwald,<br>Furth im Wald   | Gabbwand<br><a href="#">R - A</a>                                      |
|                 |                     |  | <b>Anorthosite</b>   |                     |   | USA,<br>Canada, Norway  | Carlton Peak<br><a href="#">R - A</a>                                  |
|                 |                     |  | <b>Diorite</b>   |                     | plutonic equivalent to Andesite<br><br>< 5 % quartz (5-20 % quartz is Quartz diorite, which than would count as Granitoid)                                    | USA,<br>Odenwald, Kyffhäuser,<br>Bayerischer Wald, Ruhla  | Diorite Peak<br>(Colorado)<br><a href="#">R - A</a>                    |
|                 |                     |  | <b>Monzonite</b>   |                     | Looks similar to Granite  | Italy, USA  | Joshua Tree<br><a href="#">R - A</a>                                   |
|                 |                     |  | <b>Granitoids</b>  | <b>Syenite</b>      | Looks similar to Granite, but 0-5 % (-20 % Quarzyenit) quartz only. (In German only > 20 % Quartz is Granitoid!)  | USA,<br>Odenwald, Schwarzwald,<br>Thüringer Wald  | Little Falls (New York)<br><a href="#">R - A</a>                       |
|                 |                     |  |  | <b>Granodiorite</b> | plutonic equivalent to Trachyt<br><br>equivalent to dazite,<br><br>looks very similar to Granite  | Yosemite (USA)  | Half Dome<br>El Capitan<br><a href="#">R - A</a>                       |
|                 |                     |  |  | <b>Granite</b>      | <a href="http://www.climbing.com/climber/10-things-you-didnt-know-about-granite/">http://www.climbing.com/climber/10-things-you-didnt-know-about-granite/</a> | Yosemite (USA)<br>Mont Blanc, Bergell,<br>Schwarzwald, Harz,<br>Fichtelgebirge<br>Steinwald<br>Oberpfälzer Wald                 | El Capitan<br><br>Rudolfstein<br>Räuberfelsen<br><a href="#">R - A</a> |
|                 |                     |  |  | <b>Tonalite</b>     | looks very similar to Granite   | Yosemite (USA),<br>Periadriatic Seam  | El Capitan<br>Rieserferner,<br>Adamello<br><a href="#">R - A</a>       |
|                 |                     |  | <b>Volcanic (Effusive rocks)</b><br><br>Solidified < 5 km depth – earth surface<br><a href="#">R - A</a> | <b>Andesite</b>     | volcanic equivalent to "Diorite"  | Vogelgebirge (CZ),<br>Japan   | Žarnov (CZ)<br>Jogasaki (Japan)<br><a href="#">R - A</a>               |
|                 |                     |  |  | <b>Trachyte</b>     | volcanic equivalent to "Syenite"  | Weidenhahn (Rheinland-Pfalz),<br>Selters (Westerwald),<br>Heřmanovský trachyt (Teplá , CZ), Valkeřický trachyt (Algendorf , CZ) | Drachenfels<br>Flinders Peak<br>(Australia)<br><a href="#">R - A</a>   |
|                 |                     |  |  | <b>Phonolite</b>    | Continental   | Rhön<br>Eifel, Kaiserstuhl,<br>Wyoming (USA)  | Steinwand<br><br>Devils Tower<br><a href="#">R - A</a>                 |
|                 |                     |  |  | <b>Rhyolite</b>     | Mostly pophytic texture, e.g. Quarzporphyr  | Sachsen<br>Odenwald   | Lobejün<br>Schriesheim<br><a href="#">R - A</a>                        |

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| <b>(German)</b>  |  |  | <b>Basalts</b><br><u>several types:</u><br>a. continental<br>b. oceanic:<br>MORB, mid ocean ridge (e.g. Island)<br>CMB, continental margin basalt (e.g. Peru)<br>IAB, island arc basalt (e.g. Japan)<br>OIB, ocean island basalt (e.g. Hawaii) | <b>Basalt</b>  | volcanic equivalent to "Gabbro"  | Eifel,<br>Steinwald (no climbs),<br>Rhön   | <b>Ettringen</b><br>(Teichelberg)<br><a href="#">R - A</a> |
|  |  |  | <b>Dolerite/Diabase</b> /<br>Diabase (engl.)   | fine-grained but not as fine as basalt<br>(not identical with Diabas (German))<br><br>chemically and mineralogically same as <b>Basalt</b> , but subvolcanic!  | Tasmania,<br><b>Rhenoherzynikum</b> (Central<br>europe and England)                      | <b>Double Dozen</b><br><a href="#">R - A</a>   |  |
|  |  |  | <b>Tephrite</b>  | Continental<br>colloquially <b>Basalt</b>  | CZ   | <b>Ralsko</b><br><a href="#">R - A</a>   |  |
|  |  |  | <b>(Basanite)</b>  | colloquially <b>Basalt</b>   | CZ   | <b>Konstantinsky</b><br>Thecrag-tagged under<br><b>Basalt</b>  |  |
|  |  |  | <b>(Diabas)</b><br>(German)  | Slightly metamorphic green basalts thus generally listed under<br><b>Metamorphic rocks</b> .   | Thüringen/Sachsen  | <b>Steinicht</b><br><br>Thecrag-tagged under<br><b>Basalt</b> as<br>metamorphism is very<br>low grade only and<br>most textures still are<br>basaltic. |  |
|  |  |  | <b>(Foidite)</b>   |  |  | <b>In case tag within</b><br><b>Thecrag as Volcanic</b>  |  |
|  |  |  | <b>(Latite)</b>  |  |  |  |  |
|  |  |  | <b>(Dacite)</b>  | volcanic equivalent to Granodiorite and Tonalite   |  |  |  |
|  |  |  | <b>Ignimbrite</b>  | pyroclastics molten together, fine matrix  | Sachsen,<br>Bozener Quarzporphyr, (I)<br>New Zealand,<br>Yucca Mountain (Nevada)         | <b>Rochlitzer Berg</b><br><b>Pfattner Wände</b><br><b>Waikato</b><br><a href="#">R - A</a>   |  |
|  |  |  | <b>Tuff</b>  | > 75 % pyroclastics, often light weighted because of included gas  | Japan,<br>USA,<br>Frankenwald,<br>Ettringen, Eifel, Rochlitz,<br>Hilbersdorf, Cappadocia | <b>Jo-yama</b><br><b>Deadman Summit</b><br><b>Fattigsmühle</b><br><a href="#">R - A</a>  |  |
|  |  |  | <b>Agglomerate</b>   | Pyroclastica, > 75 % volcanic bombs  | Japan,<br>West-Africa (?),<br>Eifel, Stromboli,  | <b>Mitsutouge</b><br><b>Ascension (?)</b><br><a href="#">R - A</a>   |  |
|  |  |  | <b>Breccia</b>   | volcanic breccia (sharp edged components – also see "sedimentary" rocks) due to eruptions/explosions or autobreakage, in volcanic pipes, lava and around volcans   | Frankenwald<br>California  | <b>Fattigsmühle</b><br><b>The Pinnacles</b><br><a href="#">R - A</a>   |  |
| <b>Hydrothermal and Metasomatic</b><br><a href="#">R - A</a> | <b>Quartz</b><br><a href="#">R - A</a> |  |  | SiO <sub>2</sub><br><br>Do not mix up with "Quartzite" which origins in sandstone) or with "Chert" (originating in marine sediments). However, in single cases hydrothermal actifity might be reason for sedimentary cherts, too (hot spring chert deposit, 'Deseado Massif', Patagonia) | Hydrothermal:<br>Bayerischer Wald,<br>Böhmischer Pfahl (CZ)                              | <b>Pfahl</b><br><b>Götheferzen</b>   |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  | <b>Carbonates</b>  |  | Atlantis Massiv, submarine   | <b>Lost City</b>   |