

Breccia Encyclopedia Article

Breccia

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Breccia

Breccias are rocks composed of angular clasts (fragments). In monomictic breccias, clasts have the same composition, whereas polymictic breccias contain clasts of different compositions. Sedimentary breccias comprise more than 30% gravel-size (>2mm) angular clasts produced by mechanical **weathering** or brittle deformation of nearby rocks. Their angular shape implies minimal transport. Sedimentary breccias develop at the base of talus slopes or in proximity to active faults. Karst breccia forms during **erosion**, dissolution and collapse of **limestone**. Pressure solution due to high local stresses at contacts between angular fragments of limestone, **marble**, or **chert** can result in interpenetration of clasts. Breccias can form during the emplacement of igneous bodies by explosive exsolution of volatile phases and/or explosive interaction of **magma** with **groundwater**. Intrusive breccias (such as associated with kimberlite pipes) often contain fragments of both intrusive and host rocks. Igneous breccia dykes may contain a wide range of **rock** fragments sampled during magma ascent and thus, provide information about the composition of rocks at deeper levels. Volcanic breccias containing lithic (rock) and vitric (**glass** and **pumice**) fragments form near subaerial volcanic vents.

Fault brecciation (or tectonic comminution) can occur due to the development and linkage of a network of fractures during faulting in the upper **crust**. The size of breccia fragments is highly variable. Milling or wear abrasion during displacement on faults may result in further brecciation and size reduction. Fracturing occurs when the applied stress exceeds the brittle resistance of the material or by transient elevation of fluid pressure (hydraulic or fluid-assisted brecciation). The interaction of hydrothermal fluids with tectonically brecciated rock produces hydrothermal breccias common in ore deposits. Brecciation may also occur due to implosion of a vein resulting from a sudden decrease in pressure (critical fracturing) in response to a sudden opening of **space** generated by rapid slip or intersection between different veins. When fault slip is extremely rapid, melt generated by frictional heating is injected along fractures to produce veins of black glass (pseudotachylite) surrounding angular fragments of the surrounding rock.

Impact melt-breccias form by the fracturing and fusion of rocks under extreme pressures and temperatures rapidly induced during meteorite impacts. Impact melt-breccias contain partially or completely melted clasts of basement rocks within a cryptocrystalline glass, **feldspar** and calcium-pyroxene-rich matrix. Impact-melt breccias containing clastic debris and glass fragments produced by meteorite bombardment have been collected from the surface of the **Moon** during Apollo missions.