Cataclastic deformation band

Rocks react to the stress of brittle regimes by forming extended fractures and shear fractures (slip surfaces). These fractures are sharp and mechanically weak discontinuities, making them more likely to be reactivated during renewed stress accumulation. At least this is how non-porous and low porous rocks react. In highly porous rocks and sediments, brittle deformation is another deformation structure called a deformation band, but is expressed by those involved. Relationship with the classification of movements of deformation bands and fractures of low porous and non-porous rocks. T, thickness; D, displacement. The deformation band is the mm thickness area of local compression, shear and/or expansion of the deformed porous rock. The figure above shows how the deformation band is dynamically related to fractures of non-porous and low porous rocks, but there are good reasons why deformation bands should be distinguished from regular fractures. One is that it is thick and at the same time represents a shear displacement smaller than the normal slip surface of the comparison length (figure (a) below; this led to a sharp discontinuity to fractures, to the term table acclimatization; another is that most strain bands maintain cohesion or even show increased cohesion while cohesion is lost or decreased in ordinary fractures; it also tends to represent objects with low transmission tables on rocks with high deformation bands. This reduction in causality is associated with the collapse of pore space, as seen in the band in Sinai, pictured below (b). In contrast, most regular fractures increase transmission, especially low transmission and insolytic rocks. (a) Cataclysmic strain band of porous Navaho sandstone. The thickness of the band depends on the size of the surface, and the shear offset is less than 1 cm (coins are 1.8cm). (b) Cataclysmic deformation band of the anoddu (left) and thin (right) of the Sinai Nubian sandstone. Note the extensive grinding and reduction of porability of grains (the pore space is blue in thin sections). The width of the band is 1 mm. The difference between a porous rock and a brittle fracture of a porous rock lies in the fact that the porous rock has a pore volume that can be utilized during grain reconstruction. Pore space can effectively make rolling and sliding of grains. Even if the grain is crushed, the grain fragments can be made up of a nearby pore space. The motor freedom associated with pore space can form a special class of structures called deformation bands. How is the deformation band different from regular fractures of non-porous rocks? Here are some characteristics: Bands: Strain bands are limited to highly porous granular media, especially porous sandstone. Shear deformation bands are a wider area of deformation than regular shear fractures of comparative displacement. Strain bands do not develop large offsets. Even deformation bands with a length of 100 m have little offset in excess of a few centimeters, while shear fractures of the same length tend to show displacement on a meter scale. Strain bands occur in areas associated with a single structure, cluster, or slip surface (bad deformation band). This relates to the way defects are formed in porous rock by defects in the deformation band area. Like fractures, deformation bands can be classified in an exercise framework where shear (deformation) bands, expansion bands, and compression bands form the final member (primary drawing). They are also interested in identifying mechanisms that work during strain band formation. The deformation mechanism depends on internal and external conditions such as mineralogy, grain size, grain shape, grain alignment, cement, porability, stress conditions, etc., and various mechanisms produce bands with different petroleum properties. Therefore, the classification of deformation bands based on the deformation process is particularly useful when transmission and fluid flow are an issue. The most important mechanisms are: granular flow (grain boundary sliding and grain rotation) catalyst (grain fracture) Phyllosilicate different types of dosy dissolution and cement deformation deformation, distinguished by the dominant deformation mechanism. The deformation band is named after the property deformation mechanism, as shown above. Brittle deformation mechanism. Granule flow is common during shallow deformation of porous rocks, and the flow of upheaval occurs during the deformation of well-integrated sedimentary rocks and non-porous rocks. Separation bands are developed by grain rolling, grain boundary sliding and shear-related separation of grains through the destruction of grain bonding cement; A process called particulate or granular flow (pictured above). Separation bands are usually found in sandstone properly integrated with sand, forming defects created in most sandbox experiments. The separation band may be almost invisible in clean sandstone, but it can detect where it crosses and offsets the ramine (pictured below). Their true offset is usually a few centimeters, and their thickness depends on the size of the particles. Fine sand (stone) develops bands up to 1 mm thick, while coarse sand (stone) hosts single bands that are more than 5 mm thick. Macro and separation bands are soft shear areas that can be continuously tracked via sand laminate bands. Most pure and well-aligned quartz sand deposits are already compressed to the extent that the initial stage of shear contains some swelling (expansion band), but continues to be shear-related Reorganization can reduce poroity later on. The right dip-dysm band overshoots the left immersion soft sedimentation blister band (almost invisible). Sandstone is very porous except for a thin layer without a compression band. Thus, the dedicity band was formed of very high porous sandstone. Thin cross-sectional photographs show that compression is supported by dissolution and some grain fractures. Southern Utah, The Navaho Sandstone. Filocicated bands (also known as framework filocilicate bands) are formed in sand (stones), which exceed approximately 10-15% of the content of platy minerals. They can be considered a special type of separation band where platy minerals promote grain sliding. Clay minerals tend to blend with other mineral grains in the band, and coarse filocilicate grains align to form local fabrics within the band due to rotation caused by shear. The filosilicase band is easy to detect because the aligned filosilicase gives the band a distinct color or fabric reminiscent of a philosilicase-rich ramine. If the philocelycade content of the rock changes in the bedding or ramina interface, the deformation band may change from a nearly invisible separation band to a filocilicase band. If clay is the dominant platy mineral, the band is a fine, low porous area that can accumulate offsets in excess of a few centimeters exhibited by different types of deformation bands. This apparently relates to the staining effect of platy minerals along the phyllosilicate band, which responds to curing all strains caused by the peristalsis of grains. If the clay content of the host rock is high enough (more than 40%), the deformation band turns into a clay stain. Clay stains usually display authoring and classify them as slip surfaces rather than deformation bands. Examples of strain bands turning into clay stains are common when they leave the sandstone layer. Cataclysmic bands form a form in which mechanical particle destruction is important (Figure b). They are a classic transformation band first described by Attila Aydin in the WesternColora Highlands in the United States. He noted that many cataclysm bands consist of a central cataclysm core contained within the mantle of (usually) compressed or gently fractured grains. The core is the most obvious and is characterized by a reduction in grain size, each particle, and an important pore space collapse (Figure b). Grinding of grains causes a wide range of grain interlocking, which promotes strain hardening. Strain curing may explain the small shear displacement observed in the cataclysm deformation band (3-4cm). Some revulsion bands are pure compaction bands (pictured above), and most are shear bands with compression. Cataclysmic bands occur most often in deformed sandstone at depths of about 1.5-3 km, although evidence of catalyticism is also reported in strain bands at shallow depths. Comparison suggests it The formed cataclysm deformation band shows a less intensive catalyst than formed at a depth of 1.5-3 km. Cement and dissolution of quartz and other minerals may occur preferentially in the strain band where tuy oil-based minerals grow on fresh surfaces formed during grain grinding and/or grain boundary sliding. This great growth of quartz can generally be seen in the deformation band of sandstone buried at a depth of 2 ~ 3km (>90C), it may occur long after the band is formed. A very dense flock of cataclysmic strain bands in The Endrada Sandstone, Utah. Strain bands form common components of porous oil, gas, and water storage and occur in single bands, cluster areas, or fault damage zones. It is unlikely to form a seal that can hold significant hydrocarbon columns during geological time, but in some cases it can affect fluid flow. The ability to do so depends on the internal transmission structure and thickness or frequency. Obviously, the area of the cataclysm variation band shown in the figure above will have a much greater impact on fluid flow than the single cataclysm band shown in figure a or b at the top. Cataclysmic deformation bands show the most significant reduction in transmission. Strain band transmission is again dominated by a deformation mechanism that acts during formation that depends on multiple retalods and physical factors. In general, separation bands show little porosity and transmission reduction, and filosilicases and especially cataclysmic bands show a decrease in transmission up to several weeks. Because the deformation band is thin, the number of strain bands (cumulative thickness) is important when evaluating its role in the oil store. Conjugate (simultaneous and opposite hand) set of cataclysmic deformation bands in sandstone. Note the positive relief of deformation bands due to grain grinding and cement. Bands fade down into more granular, less aligned units. Sandstone in Endrada, Utah. Their continuity, poro/transmission and change in direction are also important. Many people show significant changes in transmission along strikes and dips due to variations in the amount of catalyst, dysmic or filocilicate stains. Deformation bands, for example, tend to define a set with a preferred direction (pictured above), such as the damage area, the organization may affect the fluid flow of the oil store during water injection, for example. All these factors make it difficult to assess the effectiveness of strain bands in reservoirs, and each reservoir must be evaluated individually according to local parameters such as the time and depth of deformation, burial and cement history, mineralogy, sediment phase, etc. The impact of deformation bands on oil or groundwater production depends on the transmission contrast, cumulative thickness, direction, and direction. And the connection. Given the different types of strain bands and the different effects on fluid flow, it is important to understand the underlying conditions that control when and where they form. A number of factors are affected, including burial depth, tectonic environment (stress condition), and host rock characteristics such as lisification, mineralization, grain size, alignment, and grain shape. Some of these factors, especially minerals, grain size, rounding, grain shape and alignment, are somewhat constant for a given layer of sedimentary rock. However, because it can vary from layer to layer, drastic changes in the development of deformation bands can appear from one layer to the next. Other factors such as pores, transmission, limiting pressure, stress conditions and cement are likely to change over time. As a result, the initial deformation band may differ from those formed in later stages of the same porous rock layer, such as deeper burial depths. Thus, the sequence of the deformation structure of a given rock layer reflects the physical changes experienced through the history of sediment burial, lithification and uplift. Different types of strain bands form at different stages during burial. Extended fractures (Mode I fractures) are most likely to form during uplift. Use diagrams and add property structures to illustrate typical structural developments in burials and uplifting sedimentary rock (pictured above). The earliest forming deformation bands in sandstone are usually separation bands or filocilicase bands. These structures are formed at low shrinkage pressure (shallow burial) when the force across the particle contact surface is low and particle bonding is weak, so they are displayed at the shallow level of the figure at the above numbers and ends. Many early separation bands are associated with local shale diafirism, basic salt motion, gravitational sliding, and local gravitational control variants such as glaciers. Cataclysmic deformation bands can occur in properly well-ested layers of pure sand at shallow burial depths, but they are much more common in deformed sandstone at depths of 1-3 km. Factors promoting shallow burial cataclosis include small grain contact areas, i.e. good sorting and versatile grains, the presence of feltfares or other non-platy minerals with division and lower hardness than quartz, and weak lysine debris. Quartz, for example, rarely causes granule fractures under low limiting pressures, but can be fractured if peeled off or sleed. At deep depths, a wide range of bi-movements are facilitated by high particle contact stresses. A rich example of the Earl strain band is found in the Jurassic sandstone of the Colorado Highlands, where the age relationship between the early separation band and later the cataclysmic band is very consistent (pictured above). When sandstone becomes cohesive and becomes porous during recission (left Above), deformation is caused by crack propagation instead of pore space collapse, and fractures filled with non-slip surfaces, joints and minerals are formed directly without the formation of bulbs in the deformation band. That's why late, overprinting structures almost invariably slide fractures filled with surfaces, joints and minerals. Slip surfaces can also be formed from defects in the porous deformation band area at store depths. Joints and veins typically post both separation bands and cataclysmic bands in sandstone. The transition from strain banding to joining can occur, especially as poroability decreases through quartz dissolution and precipitation. Since the effects of strengthening these pain controls can be locally different, deformation bands and joints can occur simultaneously in different parts of the sandstone layer, but the general pattern is deformation bands (forming slip surfaces) and finally joints (manoeoscopic fractures in the picture above) and perhaps defective joints. The latest fractures of uplifting sandstone tend to produce a broad and regionally eclectic set of joints, or at least be affected by overload and cooling off during regional rise. These joints are pronounced places where sandstone is uplifted and exposed, such as the Colorado Plateau, but are unlikely to develop in underground oil reservoirs that are not exposed to significant uplift. Therefore, knowing the burial/uplifting history of the basin in relation to the timing of the deformation event seems to be very useful given the type of structure that exists in the sandstone reservoir. Conversely, examining the type of deformation structure that currently exists also provides information about deformation depth and other conditions during deformation. A provisional illustration of how different strain band types relate to the philosilicade content and depth. Many other factors affect the boundaries described in this diagram, and boundaries should be considered uncertain. Credit: Haakon Posen (Structural Geology) Geology)