**(a) Pass through**



**Particle**

**Crack**

**(b) Crack-tip blunting**



**Particle**

**Crack**

**(c) Extended-back**



**Particle**

**Crack**

**(d) Crack-forking**



**Particle**

**Main crack**

**Secondary crack**

**(e) Pass round**



**Particle**

**Crack**

**Fig. 17 The meso-scopic crack propagation modes in red sandstones**