*Прочтите текст. Дайте определение понятию – физическое свойство материала.*

**Physical property**

A physical property is any [property](http://en.wikipedia.org/wiki/Property_%28philosophy%29) that is [measurable](http://en.wikipedia.org/wiki/Measurement) whose value describes a [physical system's](http://en.wikipedia.org/wiki/Physical_system) state. The changes in the physical properties of a system can be used to describe its transformations (or evolutions between its momentary states).

Physical properties can be [intensive or extensive](http://en.wikipedia.org/wiki/Intensive_and_extensive_properties). An intensive property does not depend on the size or amount of matter in the object, while an extensive property does. In addition to extensiveness, properties can also be either [isotropic](http://en.wikipedia.org/wiki/Isotropy) if their values do not depend on the direction of observation or [anisotropic](http://en.wikipedia.org/wiki/Anisotropy) otherwise. Physical properties are referred to as [observables](http://en.wikipedia.org/wiki/Observable). They are not [modal properties](http://en.wikipedia.org/wiki/Modal_property).

Often, it is difficult to determine whether a given property is physical or not. [Color](http://en.wikipedia.org/wiki/Color), for example, can be "seen"; however, what we perceive as color is really an interpretation of the reflective properties of a surface. In this sense, many ostensibly physical properties are termed as *[supervenient](http://en.wikipedia.org/wiki/Supervenience%22%20%5Co%20%22Supervenience)*. A supervenient property is one which is actual (for dependence on the reflective properties of a surface is not simply imagined), but is secondary to some underlying reality. This is similar to the way in which objects are supervenient on atomic structure. A "cup" might have the physical properties of mass, shape, color, temperature, etc., but these properties are supervenient on the underlying atomic structure, which may in turn be supervenient on an underlying quantum structure.

[Chemical properties](http://en.wikipedia.org/wiki/Chemical_property)  determine the way a material behaves in a [chemical reaction](http://en.wikipedia.org/wiki/Chemical_reaction). Physical properties do not change the chemical nature of matter.

**Physical properties**

**Hardness**

Hardness is the measure of how resistant [solid](http://en.wikipedia.org/wiki/Solid) [matter](http://en.wikipedia.org/wiki/Matter) is to various kinds of permanent shape change when a [force](http://en.wikipedia.org/wiki/Force) is applied. Macroscopic hardness is generally characterized by strong [intermolecular bonds](http://en.wikipedia.org/wiki/Intermolecular_bond), but the behavior of solid materials under force is complex; therefore, there are different measurements of hardness: *scratch hardness*, *indentation hardness*, and *rebound hardness*. Hardness is dependent on [ductility](http://en.wikipedia.org/wiki/Ductility), [elastic](http://en.wikipedia.org/wiki/Elasticity_%28physics%29) [stiffness](http://en.wikipedia.org/wiki/Stiffness), [plasticity](http://en.wikipedia.org/wiki/Plasticity_%28physics%29), [strain](http://en.wikipedia.org/wiki/Deformation_%28mechanics%29), [strength](http://en.wikipedia.org/wiki/Strength_of_materials), [toughness](http://en.wikipedia.org/wiki/Toughness), [viscoelasticity](http://en.wikipedia.org/wiki/Viscoelasticity), and [viscosity](http://en.wikipedia.org/wiki/Viscosity).

Common examples of hard matter are [ceramics](http://en.wikipedia.org/wiki/Ceramic), [concrete](http://en.wikipedia.org/wiki/Concrete), certain [metals](http://en.wikipedia.org/wiki/Metals), and [superhard materials](http://en.wikipedia.org/wiki/Superhard_materials%22%20%5Co%20%22Superhard%20materials), which can be contrasted with [soft matter](http://en.wikipedia.org/wiki/Soft_matter).

[**Elasticity**](http://en.wikipedia.org/wiki/Elasticity_%28physics%29) **and** [**plasticity**](http://en.wikipedia.org/wiki/Plasticity_%28physics%29)

In [solid mechanics](http://en.wikipedia.org/wiki/Solid_mechanics), solids generally have three responses to [force](http://en.wikipedia.org/wiki/Force), depending on the amount of force and the type of material:

* They exhibit [elasticity](http://en.wikipedia.org/wiki/Elasticity_%28physics%29)—the ability to temporarily change shape, but return to the original shape when the pressure is removed. "Hardness" in the elastic range—a small temporary change in shape for a given force—is known as [stiffness](http://en.wikipedia.org/wiki/Stiffness) in the case of a given object, or a high[elastic modulus](http://en.wikipedia.org/wiki/Elastic_modulus) in the case of a material.
* They exhibit [plasticity](http://en.wikipedia.org/wiki/Plasticity_%28physics%29)—the ability to permanently change shape in response to the force, but remain in one piece. The [yield strength](http://en.wikipedia.org/wiki/Yield_%28engineering%29) is the point at which elastic deformation gives way to plastic deformation. Deformation in the plastic range is non-linear, and is described by the[stress-strain curve](http://en.wikipedia.org/wiki/Stress-strain_curve). This response produces the observed properties of scratch and indentation hardness, as described and measured in materials science. Some materials exhibit both [elasticity](http://en.wikipedia.org/wiki/Elasticity_%28physics%29) and [viscosity](http://en.wikipedia.org/wiki/Viscosity) when undergoing plastic deformation; this is called [viscoelasticity](http://en.wikipedia.org/wiki/Viscoelasticity%22%20%5Co%20%22Viscoelasticity).
* They [fracture](http://en.wikipedia.org/wiki/Fracture)—split into two or more pieces.

[**Strength**](http://en.wikipedia.org/wiki/Strength_of_materials)

[Strength](http://en.wikipedia.org/wiki/Strength_of_materials) is a measure of the extent of a material's elastic range, or elastic and plastic ranges together. This is quantified as [compressive strength](http://en.wikipedia.org/wiki/Compressive_strength), [shear strength](http://en.wikipedia.org/wiki/Shear_strength), [tensile strength](http://en.wikipedia.org/wiki/Tensile_strength) depending on the direction of the forces involved. [Ultimate strength](http://en.wikipedia.org/wiki/Ultimate_strength) is an engineering measure of the maximum load a part of a specific material and geometry can withstand.

[**Brittleness**](http://en.wikipedia.org/wiki/Brittleness)

[Brittleness](http://en.wikipedia.org/wiki/Brittleness), in technical usage, is the tendency of a material to fracture with very little or no detectable deformation beforehand. Thus in technical terms, a material can be both brittle and strong. In everyday usage "brittleness" usually refers to the tendency to fracture under a small amount of force, which exhibits both brittleness and a lack of strength (in the technical sense). For perfectly brittle materials, yield strength and ultimate strength are the same, because they do not experience detectable plastic deformation. The opposite of brittleness is[ductility](http://en.wikipedia.org/wiki/Ductility).

[**Toughness**](http://en.wikipedia.org/wiki/Toughness)

The [toughness](http://en.wikipedia.org/wiki/Toughness) of a material is the maximum amount of [energy](http://en.wikipedia.org/wiki/Energy) it can absorb before fracturing, which is different from the amount of [force](http://en.wikipedia.org/wiki/Force) that can be applied. Toughness tends to be small for brittle materials, because elastic and plastic deformations allow materials to absorb large amounts of energy.