Precious metallic alloys

- gold (high purity: 99.7%)
- gold alloys (with high gold content)
- gold-platina alloy
- silver-palladium alloy

Base metallic alloys

- cobalt-chrome alloy
- nickel-chrome alloy

Amalgam

- Silver amalgam or “conventional” dental amalgam (65% Silver(min), 29% Tin(max), 6% Copper(max), 2% Zinc(max), 3% Mercury(max))
- High copper dental amalgam (40% Silver(min), 32% Tin(max), 30% Copper(max), 2% Zinc(max), 3% Mercury (max))

The composition of alloy powder is controlled by the ISO Standard for dental amalgam alloy in order to control properties, such as corrosion and setting expansion.[4]

Dental Amalgam is widely used because of the ease of fabricating the plastic material into rigid direct fillings, completed in single appointment, with acceptable strength, hardness, corrosion, and toxicity properties. It is more forgiving of preparation and technique than composite resins used for that purpose. High copper dental amalgam is preferred over conventional dental amalgam as it has better corrosion resistance and less susceptible to creep. Amalgam is now mainly used for posterior teeth. Although the mercury in cured amalgam is not available as free mercury, concern of its toxicity has existed since the invention of amalgam as a dental material. It is banned or restricted in Norway, Sweden and Finland. See Dental Amalgam Controversy.

Direct Gold

- Gold

Although rarely used, due to expense and specialized training requirements, gold foil can be used for direct dental restorations.

Composite resin

Dental restoration using composite bonding[5]
Main article: Dental composite

Dental composites, also called "white fillings", are a group of restorative materials used in dentistry. Crowns and in-lays can be made in the laboratory from dental composites. These materials are similar to those used in direct fillings and are tooth-colored. Their strength and durability is not as high as porcelain or metal restorations and they are more prone to wear and discolouration. As with other composite materials, a dental composite typically consists of a resin-based matrix, which contains a modified methacrylate or acrylate. Two examples of such commonly used monomers include bisphenol A-glycidyl methacrylate (BISMA) and urethane dimethacrylate (UDMA), together with tri-ethylene glycol dimethacrylate (TEGMA). TEGMA is a comonomer which can be used to control viscosity, as Bis GMA is a big molecule with high viscosity, for easier clinical handling.[6] Inorganic filler such as silica, quartz or glasses, are added to reduce polymerization shrinkage by occupying volume and to confirm radio-opacity of products due to translucency in property, which can be helpful in diagnosis of dental caries around dental restoration. The filler particles give the composites wear resistance as well. Compositions vary widely, with proprietary mixes of resins forming the matrix, as well as engineered filler glasses and glass ceramics. A coupling agent such as silane is used to enhance the bond between resin matrix and filler particles. An initiator package begins the polymerization reaction of the resins when external energy (light/heat, etc.) is applied. For example, camphorquinone can be excited by visible blue light with critical wavelength of 460-480 nm to yield necessary free radicals to start the process.

After tooth preparation, a thin primer or bonding agent is used. Modern photo-polymerised composites are applied and cured in relatively thin layers as determined by their opacity.[7] After some curing, the final surface will be shaped and polished.

Ref: https://en.wikipedia.org/wiki/Dental_restoration