List of eutectic alloys

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Eutectic alloys have two or more materials and have a eutectic composition. When a non-eutectic alloy solidifies, its components solidify at different temperatures, exhibiting a plastic melting range. Conversely, when a well-mixed, eutectic alloy melts, it does so at a single, sharp temperature.

Eutectic Alloy: A eutectic alloy is an alloy formed from two or more components that exhibits eutectic behavior. A eutectic alloy melts at a distinct temperature. Not all binary alloys form eutectic alloys. For example, gold-silver does not form a eutectoid, as the valence electrons are not compatible with super-lattice formation.

Table 3 outlines the most common eutectic alloys used for hermetic and/or vacuum packaging of IC, MEMS, and smart sensing devices, and their corresponding eutectic temperatures.

Eutectics are alloys of inorganics (mostly hydrated salts) or organics with a minimum-melting composition of two or more components, each of which melts and freezes and congruently forming a mixture of the component crystals during solidification [95].

Eutectic alloys are a type of high-entropy alloy that exhibit good castability and high mechanical strength. These alloys undergo an isothermal transformation called the eutectic reaction, which helps to reduce chemical segregation and shrinkage cavity.

The eutectic point is a unique temperature at which a combination of different substances melts or solidifies simultaneously. This temperature is the lowest possible melting point that the mixture can attain, lower than any of the substances’ individual melting points.

A eutectic mixture or system, on the other hand, is this particular combination of substances that have the characteristic of melting and solidifying at the eutectic point. In the correct proportions, the mixture components inhibit the crystallization phase of one another. These mixtures are interesting due to their uniform behavior, differing from most mixtures which have variable melting or solidifying ranges.

“Eutectic” comes from the Greek words “eu” meaning “well” or “good” and “tekn?” meaning “art”, suggesting the mixtures have ‘good art’ or ‘well crafted’ behavior in their phase transitions. British scientist Frederick Guthrie coined the term in 1884.

If you are still confused about what is and is not a eutectic, remember that the defining characteristic of a eutectic mixture is that it has a melting point lower than any of its individual components. Therefore, by definition, the eutectic point cannot be higher than the melting point of one of the components. If a mixture

does not exhibit this property, it is not considered a eutectic mixture. So, not all alloys or other mixtures are eutectics.

Whether or not a pair of substances forms a eutectic mixture depends primarily on the details of their phase diagram, which plots the state of the substances (solid, liquid, gas) under different temperatures and compositions. This is a complex question that depends on the specifics of the atomic or molecular interactions between the substances. However, there are several general factors that promote the formation of eutectic mixtures:

Remember that these factors can increase the likelihood of forming a eutectic mixture but do not guarantee it. Whether a eutectic mixture forms depends on the specifics of the system under consideration. Also, these factors primarily apply to eutectic alloys. Similar considerations apply to other types of eutectic mixtures as well.

Each diagram is marked with an arrow at the eutectic composition and indicating the current temperature (the start temperature in this case). The circle below the diagram shows a stylised representation of the alloy"s microstructure (here showing nothing of interest as the alloy is liquid).