

EXPLANATION OF SILVERFIL ZERO FREE MERCURY TECHNOLOGY

BY FOUNDER/INVENTOR

DR. RADHA, B.D.S.



Why is there unreacted (elemental mercury) present in traditional amalgams?

The only metal used in traditional amalgams that can react with mercury is silver. Mercury is a solvent for silver, platinum, palladium and gold. So, mercury will dissolve silver and the resultant silver-mercury will crystallize into a compound (Ag_2Hg_3).

Unfortunately, the dissolution of silver (in amalgams) is a slow process. Mercury reacts with silver from the outer surface of the alloy particle of silver-tin (Ag_3Sn) alloy (like soap with water). Gradually the alloy particle becomes smaller (like the soap). And some of these alloy particles remain inside the amalgam as unreacted particles.

It is an undisputed fact that small amounts of mercury remain in the amalgam. This mercury is in its elemental form.

When the Ag_3Sn alloy reacts with mercury, the tin gets separated leaving the Ag_3 to react with mercury. This Ag_3 is highly reactive and quickly will react with mercury to form Ag_2Hg_3 .

Why is there no excess mercury in an elemental form in Silverfil amalgam?

The silver that is used in Silverfil is not in a metallic state (like which is used in traditional amalgam alloys).

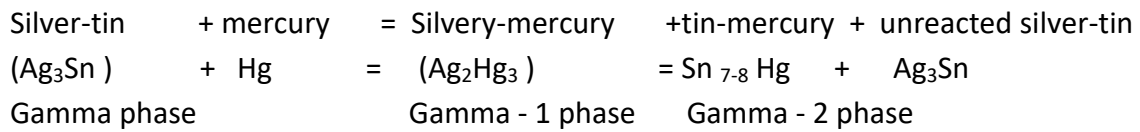
The silver is created by a chemical reduction of silver-tin (Ag_3Sn) alloy, thus creating a silver (Ag^0) which has similar reactivity to that of Ag_3 within the amalgam. Ag_3 does not exist in a physical form. Due to the high reactivity of Ag^0 , it absorbs mercury rapidly and completely. So all the mercury that is used is totally absorbed to form Ag_2Hg_3 . There is no elemental mercury at all within Silverfil amalgam. The presence of some free silver further infers that there is insufficient mercury to react with all the silver.

The absence of mercury can only take place due to the high reactivity of the silver that is used.

An electro-chemical study done at the Chemistry Dept. of University Malaya came up with a Coefficient of Diffusion of Silverfil to mercury. Such a phenomenon cannot be seen in traditional amalgams.

Dental amalgam Chemical Reactions:

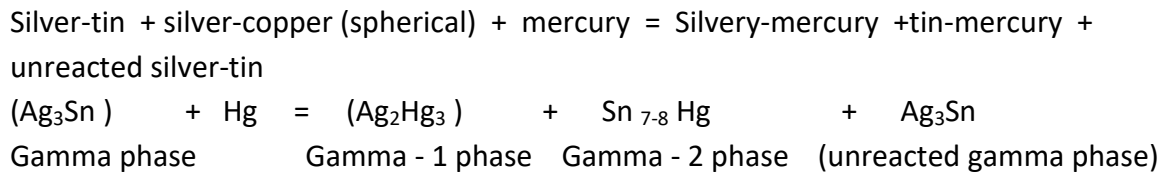
1. Traditional amalgams (high silver, low copper amalgams. Powder particles are needle shaped known in dentistry as lathe-cut particles)



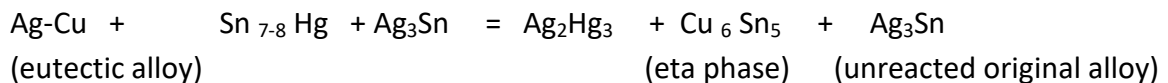
Note: Gamma phase is the starting phase.

2. Admixed High-Copper Amalgam (Low silver content) . Powder is a mix of lathe-cut & spherical shaped powder).

Amalgamation chemical reaction: Primary reaction:



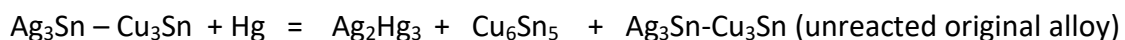
Secondary reaction:



Note: the reason for adding Ag-Cu (spherical) is to remove the tin-mercury phase (Sn₇₋₈Hg) as this is a weak and corrosion prone phase).

3. Completely Spherical alloy particles: composed of (Ag₃Sn + Cu₃Sn) -- starting alloy.

Chemical reaction:



The reason for the development of Admixed & Spherical alloys in dentistry was to reduce if not eliminate the gamma 2 phase (Sn₇₋₈Hg) because this phase is unstable and causes more corrosion thus creating pits/micro-porosity in the fillings.

Note: All these above amalgams still do contain minute amounts of mercury (Hg) as a liquid metal in the fillings.

Which of the above metals namely: silver, tin, & copper react with mercury to form a stable compound?

ONLY SILVER!

Then why not use only SILVER instead of the other metals?

Answer: Silver was tried originally in the 1880's . Silver filings from silver coins was mixed with mercury to form a paste.

The setting reaction was very prolonged. So, when the paste is filled into the tooth cavity, the tremendous expansion (because of the slow setting reaction & subsequent expansion) caused severe pain or even broke the tooth crown in some cases. So teeth had to be extracted.

So, metallic SILVER cud'nt be used alone. Tin causes contraction. So tin was added to silver to overcome the undue expansion. Then small amounts of copper was added as it makes the alloy more brittle and thus made easy for lathing or cutting during manufacturing process. Later on, more copper was added for reasons explained earlier.

Since only silver reacts with mercury, the higher the silver content, the higher the amount of mercury is needed .Otherwise the mix will be dry & grainy.

When the silver is reduced and copper is increased, the mercury amount is of course reduced. **BUT, there still remains excess mercury because all the silver cannot react with the mercury.**

(This fact is established and acknowledged by FDA, ADA & FDI).

SOLUTION!

A different form of silver must be developed that can react with mercury very rapidly. Why rapidly?

So as to reduce the chemical reaction time- meaning to reduce the resulting expansion.

A chemically produced silver is what Silverfil consists of!

Once the powder comes in contact with mercury, all the mercury used is completely absorbed (reacted) with silver. Small amounts of free silver is still present in the final amalgams. If we use more mercury to also react with the small amounts of free silver, the mix will be too soft and not user friendly to the dentists/nurses.

We also use a 2nd component which is : silver-mercury powder.

WHY?

- a). To add another grain structure to the final amalgam- improves strength.
- b). To reduce the final liquid mercury for the amalgamation .

Chemical reaction of Silverfill:



The entire chemical reaction is found to be completed in 30 mins. (Electro- Chemistry Study by courtesy, University Malaya).

It is known that reactions in traditional amalgams continues within the oral cavity for months.
