



# Deciphering Dentistry

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**Addition Silicones - Making the Impression**



## Addition Silicones - Making the Impression

The addition silicone, “polyvinyl siloxane”, the impression material was introduced in the dental world around the 1980’s and have become the go to material for various applications in removable and fixed prosthodontics and implant dentistry. The material comes in the form of two pastes – one base and one catalyst which is thoroughly mixed to dispense a uniform mix which sets in a few minutes. The two parts can be hand spatulated, but the auto mix systems have become the norm today. This material has a very high level of patient as well as dental acceptance.



*Fig 1: The two scoops of base and putty dispensed on the two spoons for mixing.*

This material is based on the polydimethyl siloxane polymer but the presences of different terminal groups accounts for various curing reactions. The base material has a polymethyl hydrogen siloxane copolymer and has silane terminal groups. The second paste, usually referred to as the catalyst, is composed of polydimethyl siloxane which has the vinyl terminated component. The catalyst also contains chloroplatinic acid. When mixed, an addition reaction occurs between the silane and vinyl groups and causes it to set with flexibility but with very good dimensional stability. There is a no perceptible dimensional change during this polymerization and it does not create any by products.

In the past, a side reaction was the production of gases which is no longer an



*Fig 2: The two parts taken on a non gloved hand to ensure complete polymerization.*



*Fig 3: The two parts being mixed thoroughly with the hand to ensure complete polymerization.*

issue because of the purification and very accurate measuring of the components along with the addition of palladium, which absorbs the gases. Silanation of the filler is also done to increase the bond strength between the filler and the polymer. It actually works as cross linker.

Earlier it was a necessary precaution to wait before pouring these impressions. The current materials do not require this step and can be poured immediately. The base as well as the activator paste contains fillers of amorphous silica/fluorocarbons which allow the immediate pouring and also add bulk and enhances the physical properties of the material. Colors are also added to the two parts. This allows a proper mixing of the base and the catalyst.

The addition silicones are generally available in various viscosities which range from very low viscosity to medium to high viscosity. This viscosity is a direct dependent on the amount of filler component. The higher the amount of filler, the more viscous will be the final setting of the material.

The mixed material also gets impacted by a property called as “shear thinning” which allows various types of viscosities to work efficiently in different situations in the oral cavity.

Current day addition silicones have a working time of two minutes to



*Fig 4: The completely mixed material without any part left alone during the mixing process.*



*Fig 5: The putty loaded on a tray with a separator to make the putty impression. The base and catalyst are of different colors in the following pics because of the soft vs the medium set of the materials.*

effectively mix and the two parts and then gives a setting time of about 4 to 5 minutes. This amount of time is generally accepted as sufficient for almost all kinds of dental impressions. Some materials add a retarder (a tetracyclic vinyl molecule) to delay the final setting time. But this has not become popular. A plain refrigeration of the material effectively delays the setting time.

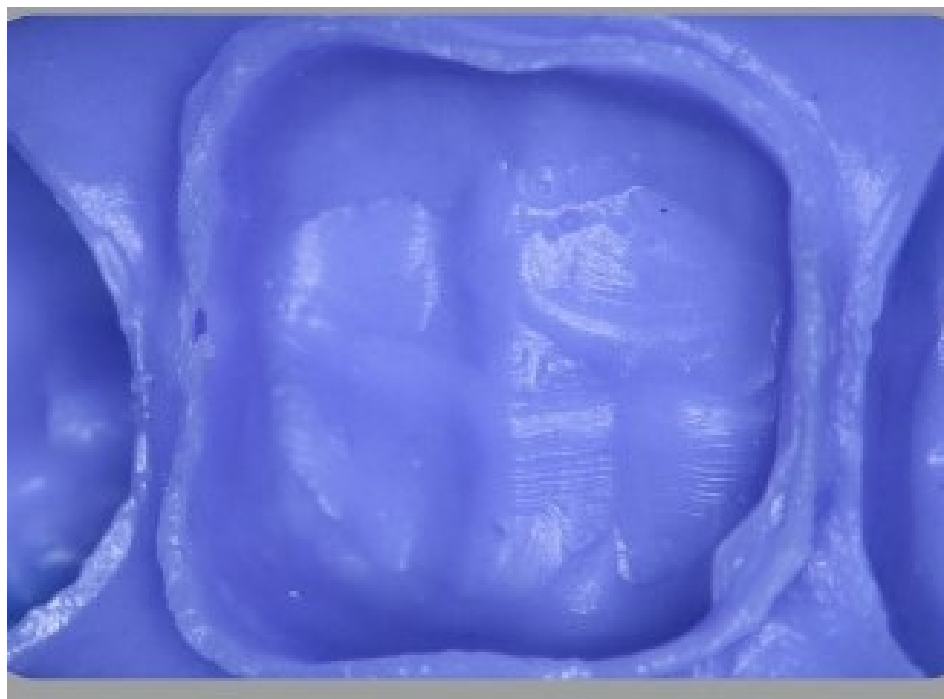
### **Usage of addition Silicones**

As mentioned before, the auto mix cartridges offer a great advantage in the mixing and working of the materials. Most companies offer the low viscosity material in the form of auto mixing tips while the thicker high viscosity material is mixed on the palms (without using latex gloves).



There are some companies which also offer the high viscosity material in an auto-mix system. Usually, the auto mix on the low viscosity suffices for most materials. Elastic recovery is the best of all elastomers and dimensional stability is so good that the impression can be used to duplicate models.

When using latex gloves, a direct contact between the glove material and the additional silicone can delay the setting reaction. This happens because of



*Fig 6: A close up shot of the putty and wash impressions completed with Ad Sil material.*

the sulphur compound which retards the polymerization reaction. The zinc diethyl dithiocarbamate is the problem material and inhibits the platinum catalyst and thus interferes with the setting process. The problem is not the glove itself but the sulphur compound.

These materials are naturally hydrophobic, which makes it

mandatory to maintain a clean field while making the impression. Any trace of saliva or even blood can create imperfections in the impression. The addition of surfactants to the additional silicone Adsil range of material has made them much more hydro-compatible and easier to use in wetter conditions.

**MADE IN INDIA**

Full arch impressions  
x 31

For C&B  
**Soft Set**

For Implant / C&B  
**Hard Set**

**Ad Sil Acura**  
Soft Putty - **Soft Set**  
Polyvinyl Siloxane Impression Material  
Shore A - 60

Contents:  
400g + 400g 2

**400g Base & 400g Catalyst**

**Ad Sil Acura**  
Soft Putty - **Hard Set**  
Polyvinyl Siloxane Impression Material  
Shore A - 80

Contents:  
400g + 400g 2

**400g Base & 400g Catalyst**

A-Silicone

**Light Body**

Upgraded Packing

**Cartridge**

**Ad Sil Acura**  
Light Cartridge  
Polyvinyl Siloxane Impression Material  
Hydrophilic  
Shore A - 65

Contents:  
2 (50ml each)

**2 x 50ml (Base & Catalyst)**

**Tubes**

**Ad Sil Acura**  
Light Tubes  
Polyvinyl Siloxane Impression Material  
Hydrophilic  
Shore A - 65

Contents:  
25ml Base + 25ml Catalyst

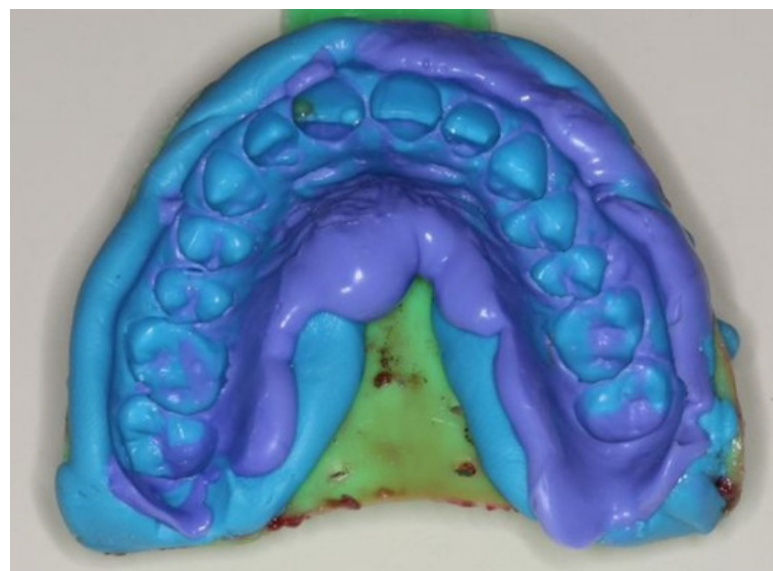
**25ml Base & 25ml Catalyst**

**Prime-Dental.in**

Impression with Ad-Sil Acura Hard Set putty Blue  
and Light Body / Wash Purple



*Fig 7: A lower impression completed.*



*Fig 8: An upper impression completed.*

One important factor to consider is the usage of adhesive material on the trays. This adhesive material reacts with the tray surface and forms a chemical bond with the tray as well as the addition silicone impression material. There is usually a waiting time of about 10 minutes after the application of the adhesive material. It is a well accepted practice to roughen the tray material prior loading the addition silicone. Perforated trays are very useful to generate a mechanical retention.

The reproduction of detail as well as the possibility of making two or three pours of the impressions makes the material an excellent choice.

Please note that all the pictures from Figs 1 to 5 are of Adsil Soft Set material and the Fig from 6 is . Adsil Wash / Light Body & Fig 7 and 8 are in Adsil Hard set. The change in color is a representation of the various forms of the material. Ideally you should not interchange the base and catalyst of the different forms of Adsil.





There is an internationally accepted standard for the check of reproduction of detail. The standard states that the material should be able to reproduce a line which is 0.02 mm thick. All available materials can achieve this very efficiently. It is also important to assess if the addition silicone remains dimensionally stable. The addition silicone demonstrate a very high degree of accuracy in most dental conditions. In fact the reduction in volume due to polymerization shrinkage is as low as 0.05 percent and this is critical as regards the dimensional stability. In fact even over a period of seven days the material remains stable to be able to pour the impression.

A small factor which should be considered is the radio-opacity of the material. Addition silicones have small amount of lead which makes them slightly radio-opaque. The benefit is if there is an accidental swallowing of the material. The radio-opacity will allow the material to be identified.

An important aspect is the disinfection of the impression prior to handling it. Especially because of the post covid scenario, this becomes all the more important. Very good sterilization is achieved with about 90 minutes of submersing the impression tray in the disinfectant. Addition silicones were not affected by immersing in either sodium hypochlorite or 2% glutaraldehyde or 0.5% povidine iodine for effective sterilization.

## **Conclusions**

The results of investigations of these materials indicate that they produce highly accurate impressions because they reproduce fine surface detail, and have excellent elastic recovery, adequate tear strengths, and exceptional dimensional stability. They are compatible with all common die materials, can be disinfected or sterilized, and can be repoured after delayed periods.





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