

# **XRD Analysis on Silverfil (Silver Amalgam)**

Date: 07/11/2008

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Ref #:

Dental Faculty  
University Malaya

# REPORT

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Subject: XRD Analysis on SILVERFIL (Silver Amalgam)

## 1. Sample Description

Dental fill material composed of two components namely silver and mercury marketed under the brand name SILVERFIL were submitted to Dental Faculty, University Malaya on 3 March 2008. The samples submitted are round in shape with diameter of 2cm and the thickness is 5mm.

## 2. Objective of Analysis

- 2.1. Determination of free Hg compositional analysis on SILVERFIL dental material using XRD technique.

## 3. Experimental Program

- 3.1 XRD method is used to characterize the amalgamated Silverfil. The Silverfil fine grain sample of < 0.2 mm across was analyzed to determine its characteristic d-spacing by noting the angle of  $\theta$  at which peak reflection were present.

## 4. Results and Discussion

### 4.1 Evaluation Of Free Hg Composition Analysis on SILVERFIL

The results on table 1 and figure 1 (appendix 1) shows that the amalgam is similar to the naturally occur metal element Moschellandsbergite ( $\text{Ag}_2\text{Hg}_3$ ). All the  $2\theta$  peak of the silverfil is similar to the Moschellandsbergite except at the  $65.7^\circ$  and  $74.2^\circ$  and there was no free mercury in the amalgam as the XRD diffractograms didn't resembled to those of the free mercury. It can be concluded that there were no free mercury in the amalgam and all the mercury existed in the amalgam form of gamma- Moschellandsbergite which has the molecular formula  $\text{Ag}_2\text{Hg}_3$ . The waste amalgam from the Silverfil is safe enough to be disposed onto earth.

## 5. Summary

It can be concluded that from the XRD study which has been carried out on the Silverfil material not to contain any excess or free mercury and all the mercury existed in the amalgam form of gamma- Moschellandsbergite which has the molecular formula  $\text{Ag}_2\text{Hg}_3$ .

# APPENDIX I

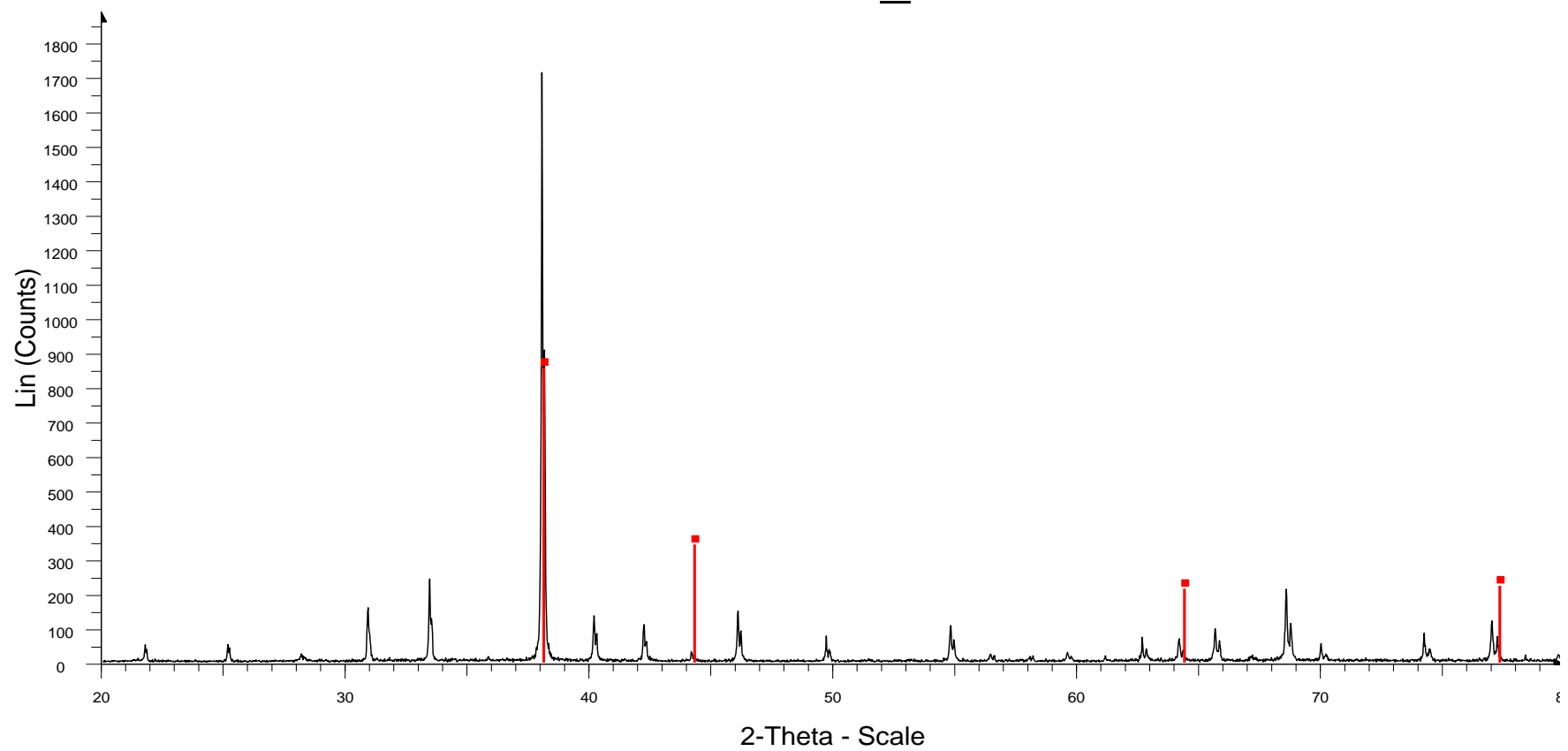
Table I – Results of XRD analyses of Silverfil amalgam

<b>CuK<math>\alpha</math> radition 2<math>\theta</math> angle SILVERFIL</b>	<b>d-spacing SILVERFIL</b>	<b>d-spacing MOSCHELLANSBERGITE</b>
21.5	4.08	4.08
24.95	3.53	3.53
30.65	2.88	2.88
33.12	2.67	2.67
37.85	2.36	2.36
40.10	2.24	2.24
42.4	2.13	2.13
44.1	2.05	2.05
46.1	1.965	1.965
49.7	1.828	1.828
54.9	1.667	1.667
62.5	1.478	1.478
64.5	1.447	1.447
*65.7	unknown	unknown
68.5	1.365	1.365
*74.2	unknown	unknown
77.1	1.236	1.236

Note: At 2 $\theta$  angle 65.7 and 74.2 for Silverfil, there is no corresponding d-spacing values for published moschellansbergite in the data. Therefore values (d-spacing) for silverfil and moschellansbergite are left blank.

Figure 1: Diffractograms of dental Silverfil Amalgam

080529H1\_E



080529H1\_E - File: 080529H1\_E.raw - Type: 2Th/Th locked - Start: 20.000 ° - End: 80.000 ° - Step: 0.020 ° - Step time: 2. s - Temp.: 0 °C - Time Started: 9 s - 2-Theta: 20.000 ° - Theta: 10.000 °  
Operations: Import  
04-0783 (I) - Silver-3 ITC RG, syn - Ag - Y: 50.00 % - d x by: 1. - WL: 1.5406 - Cubic - a 4.08620 - b 4.08620 - c 4.08620 - alpha 90.000 - beta 90.000 - gamma 90.000 - Face-centred - Fm-3m (22