

Application Note

INTRODUCTION

Klarite® Surface-Enhanced Raman Scattering (SERS) substrates consist of a photolithographically textured silicon chip coated with a thin layer of gold. In order to assess the applicability of these substrates across a wide range of chemical analyses, we have tested their resistance to a series of aggressive chemical agents, at ambient as well as elevated temperatures.

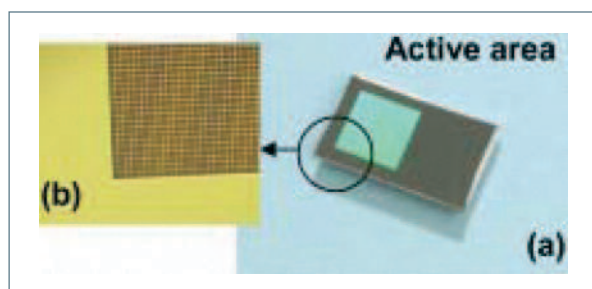


Figure 1 – (a) Klarite chip (b) optical image of active area

In order to test the robustness of the metal coating, the Klarite chips were tested with several solutions. Several common solvents, aqueous solutions and aggressive agents were used. The robustness of Klarite to common solvents is shown in table 1 and to aqueous solutions in table 2.

Substance	Concentration	Temperature	Time
Hexane	Pure	20	1 hr
Toluene	Pure	20	1 hr
Acetone	Pure	20	1 hr
Ethanol	Pure	boiling	2 hrs
Dimethyl-sulphoxide	Pure	70	16 hrs

Table 1 – Common solvents and correspondent parameters used in the tests

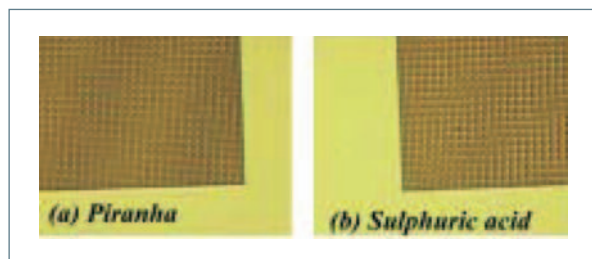


Figure 2 – Appearance of Klarite chip surface after immersion in Piranha (a) and Sulphuric Acid (b)

Substance	Concentration	Temperature	Time
Sodium hydroxide	5%	75	1 hr
Ethylene-diamine tetraacetic acid, tetrasodium salt	5%	75	1 hr
Hydrogen peroxide	10%	20	1 hr
Potassium hydroxide	2%	70	16 hrs
Potassium iodide	2%	70	2 hrs
Hydrochloric acid	10%	20	1 hr
Sulphuric acid	98%	20	20 sec
Persulphuric acid 'Piranha'		20	20 sec
Perchloric acid	70%	20	30 sec
Nitric acid	65%	20	2 min
Ethanolic potassium hydroxide	5%	70	2 hrs

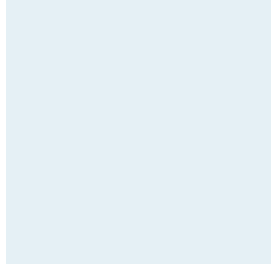
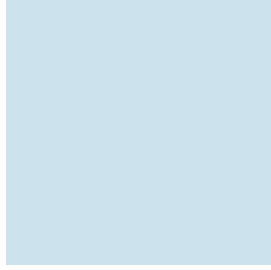
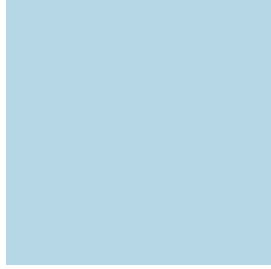
Table 2 – Various aqueous solutions and correspondent parameters used in the tests

Despite the different experimental conditions and degree of chemical reactivity, the metal coating remained intact for all solutions listed in table 1 and 2. The gold remained well adhered and did not flake, peel or detach in all cases¹. As an example, figure 2 shows the conditions of the gold after immersion in Piranha and Sulphuric Acid. No damage is evident in either case.

These results highlight the compatibility of Klarite for many applications that require aggressive solutions and/or temperatures up to 75C. Klarite's metal coating provides a robust surface that is able to tolerate aggressive acids, alkalis and organic solvents.

REFERENCES

¹ While the Klarite substrate was not damaged by aggressive chemicals, the SERS performance will depend on the dissolved analyte.



* Legal notice: All statements, information and recommendations related to products herein are based upon information believed to be reliable or accurate. However the accuracy or completeness is not guaranteed and no responsibility is assumed for inaccuracies.
Klarite is a registered trademark of D3 Technologies Limited



D3 Technologies Ltd Nova Technology Park, 5 Robroyston Oval, Glasgow G33 1AP, UK
Tel: **+44 141 5577900**
Email: **info@d3technologies.co.uk**
Web: **www.d3technologies.co.uk**