



Reduction of RZ Ink

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The following samples were tested using an RZ ink test to establish levels of photocatalytic activity:

- PURETi Clear on a smooth surfaced tile
- PURETi Clean on a smooth surfaced tile
- HYDROTECT tile sample
- PURETi Clean on a matte surfaced tile
- PURETi Clear on a piece of glass

Tile Samples

Before applying RZ ink, the section of each tile sample to be tested was cleaned. The sample area was wiped lightly with a piece of Whatman Lens cloth, dampened with deionised water to remove contaminants. The tiles were then allowed to dry for an hour in the dark.

The ink was then applied to the surface using a series of horizontal strokes from an RZ marker pen. The ink was allowed 5 minutes to dry fully, before being irradiated by UVA light to activate the TiO₂ coating. The progress of the photocatalysis was monitored using images taken using a handheld digital scanner. Plotting the red component of the image against time produces a characteristic profile in photocatalytic samples.

Glass Sample

RZ ink was applied directly to the surface of the glass and photobleached in the same manner as the tile samples.

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Results

PURETi Clear, on smooth tile

This sample displayed a good degree of photocatalytic activity, with the RZ film bleaching in an average time of 78 s, a time usually expected from samples of high activity. However the wide difference in how rapidly the two regions tested bleached the RZ would suggest the possibility that the coating is not entirely uniform. The regions were found to reach the end point of the reaction at 109 and 47 s respectively, with these times found from the intercept of the straight line sections of the profiles below (plot 1).

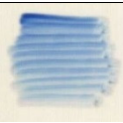
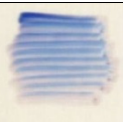
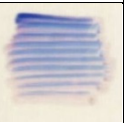
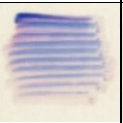
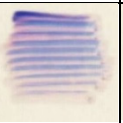
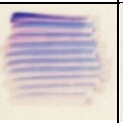
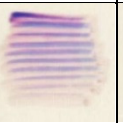
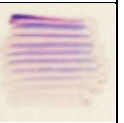








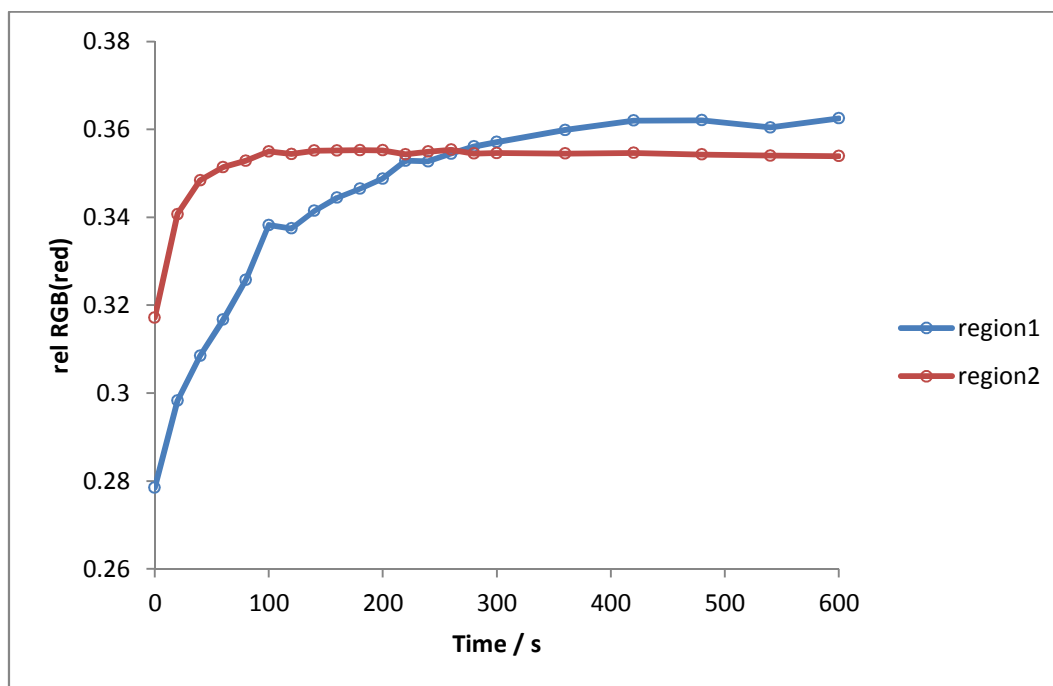
Time / s	0	20	40	60	80	100	200	300
Region 1								
Region 2								

Figure 1 – Visual change in RZ on PURETi Clear smooth tile sample

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Plot 1 – Rz breakdown on PURETi Clear smooth tile sample

PURETi Clean, on smooth tile

When the RZ ink was applied to smooth tiles coated in PURETi Clean, the ink immediately began reacting with the surface. However little of the pink colour produced as RZ is reduced on a photocatalytic surface was observed, so the dye may have reacted with an agent on the tile surface (fig.2).



Figure 2 – RZ coating on PURETi Clean smooth tile sample, before UVA irradiation

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As the RZ dye provided little information on this sample, the sample was additionally tested with an AV7 dye. This dye is slow to react and is reserved for the most active of photocatalytic samples, e.g. photocatalytic paints. It was applied to a cleaned section of the tile as a thin film, and irradiated using UVA light in the same manner as in the RZ tests. The photocatalysis is monitored in the same way, except progress is monitored using the green component of the image.

The time for the AV7 to be reduced, determined from the intercept of the straight line sections of the green colour profile, was found to average 25.1 minutes between the two regions. By contrast a self-cleaning glass sample, generally regarded as being a fast acting photocatalyst, averaged 23.9 minutes with the same dye.



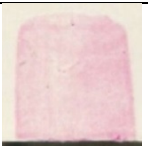
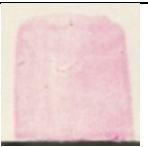

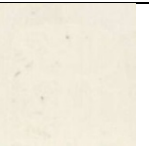

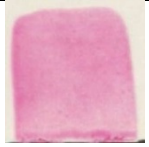

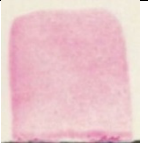

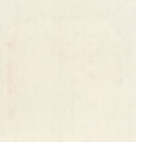
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Region 1						
Region 2						

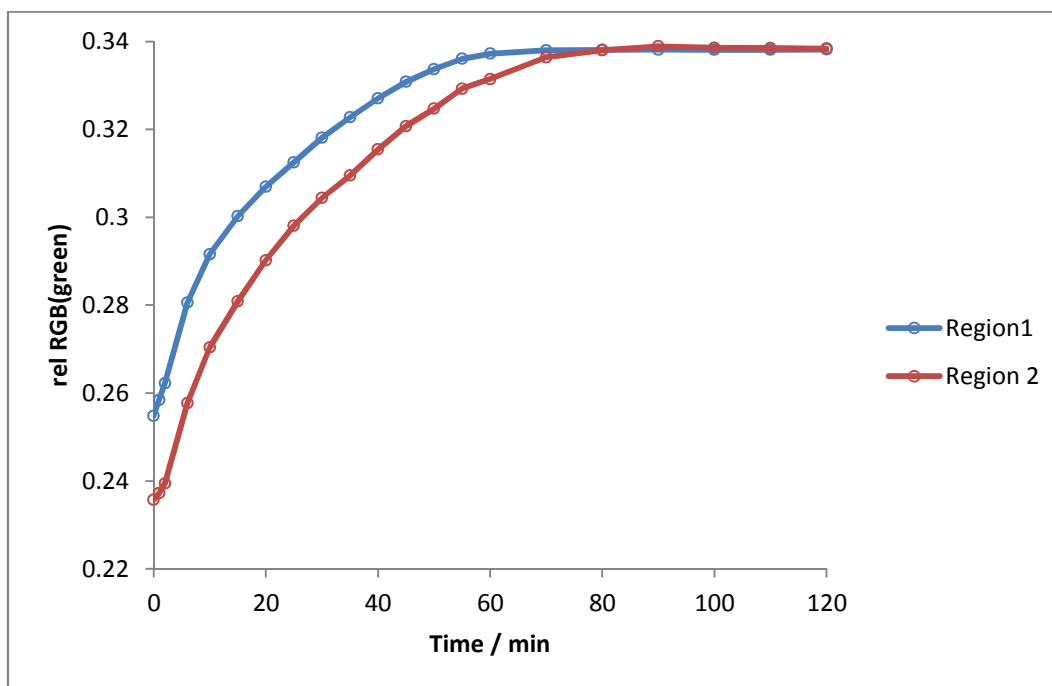
Figure 3 – Visual change in AV7 on PURETi Clean smooth tile sample

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Plot 2 – AV7 breakdown on PURETi Clean smooth tile sample

PURETi Clean, on matte tile

This sample also displayed a high degree of photocatalytic activity, with the endpoint of the RZ test found from the bleach profile (plot 3) to be 66 s on average. Unlike the coating of PURETi Clean on a smooth tile surface, the coating on a matte tile did require irradiation with UVA for the RZ to react.

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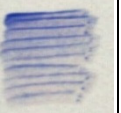
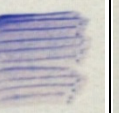
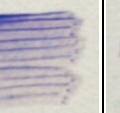
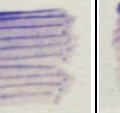
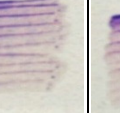






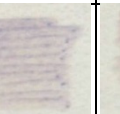
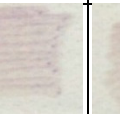

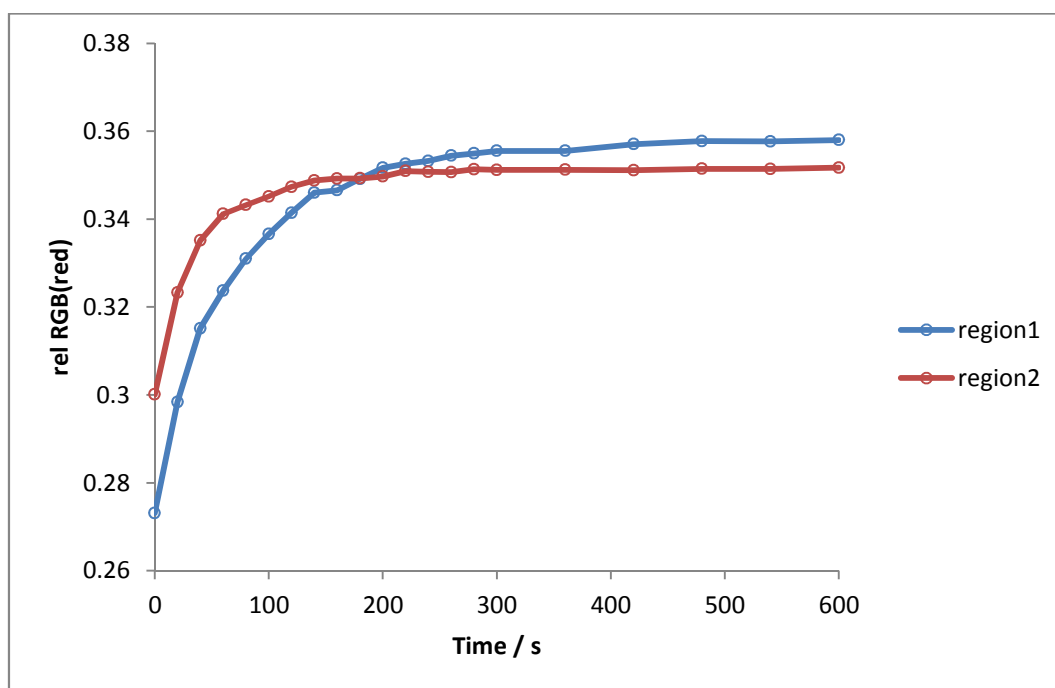
Time / s	0	20	40	60	80	100	200	300
Region 1								
Region 2								

Figure 4 – Visual change in RZ on PURETi Clean matte tile sample



Plot 3 – RZ breakdown on PURETi Clean matte tile sample

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HYDROTECT Tiles

These tiles are slow to interact with the Rz ink, with only one of the treated regions producing any reasonable colour change within an hour of irradiation. As the profile did not fully level out within the test time, an exact bleach time cannot be determined, however from the shape of the profile (plot 4) this could be estimated to be approximately 20 minutes, at least an order of magnitude slower than any of the PURETi coatings.

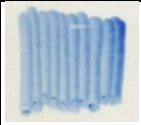

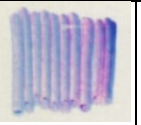
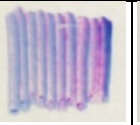
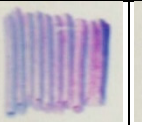
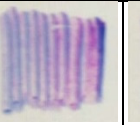
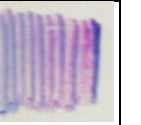







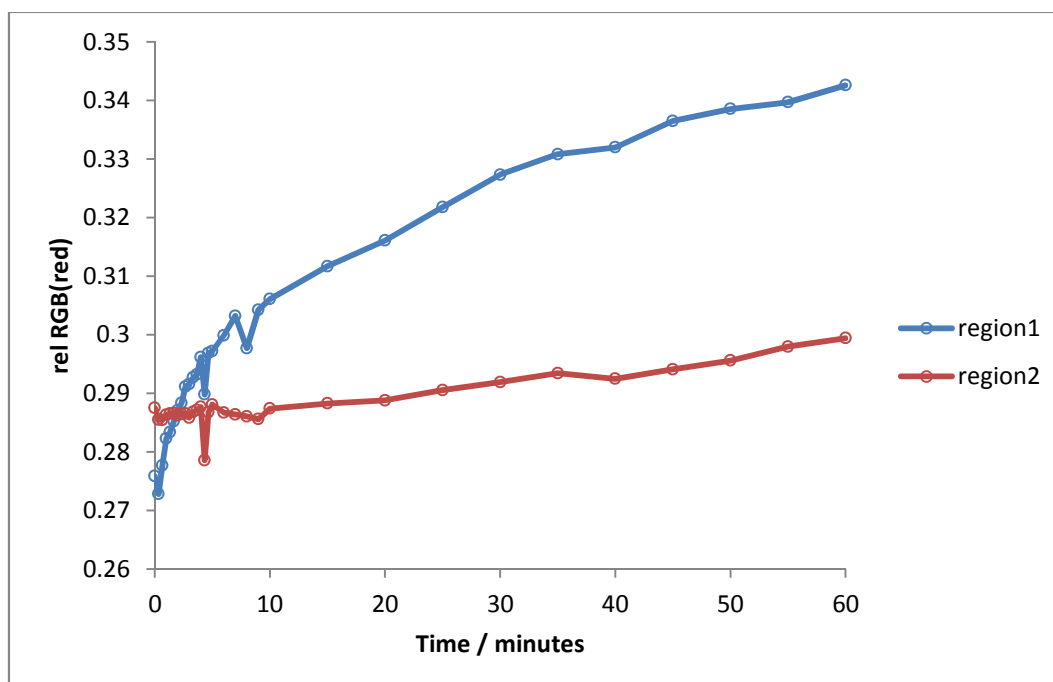
Time / min	0	10	20	30	40	50	60
Region 1							
Region 2							

Figure 5 – Visual change in Rz on HYDROTECT tile surface



Plot 4 – Rz breakdown on HYDROTECT tile surface

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PURETi Clear, on glass

The RZ ink test indicated that PURETi clear is a very active photocatalyst with the endpoint of the reaction determined to be 1.6 minutes on average. In contrast, a commercial piece of self-cleaning glass that was tested alongside reached its endpoint in 20 s. However, this result is still very rapid in contrast to the HYDROTECT technology seen on the tile.













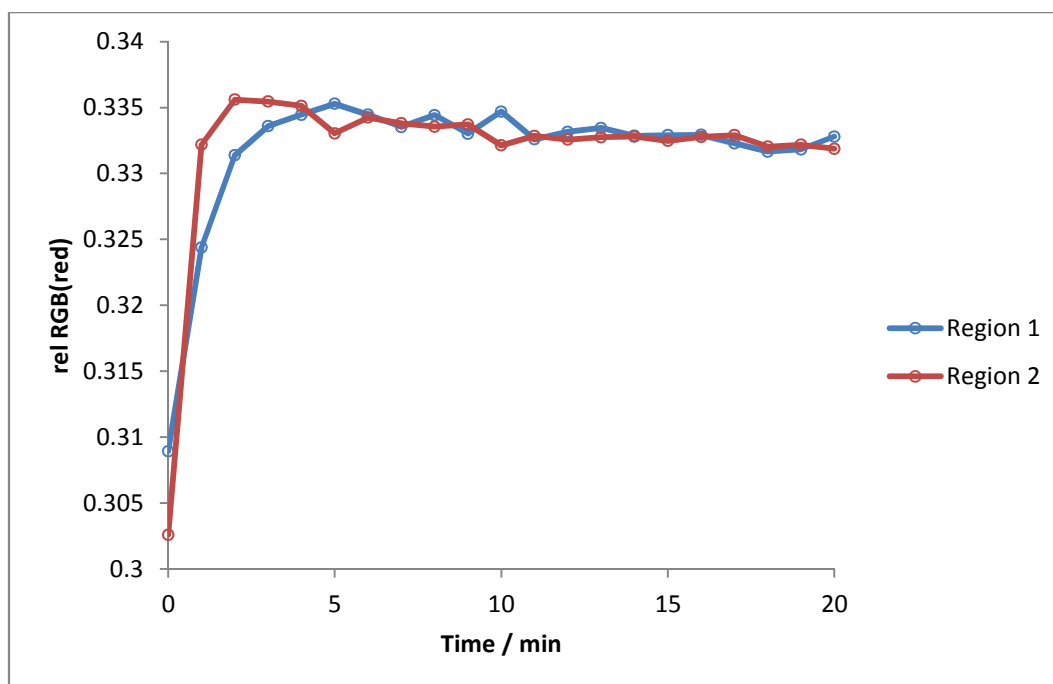
Time / min	0	1	2	3	4	5
Region 1						
Region 2						

Figure 6 - Visual change in RZ on PURETi Clear glass sample



Plot 5 – RZ breakdown on PURETi Clean glass sample



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Conclusions

Both PURETi coatings showed signs of photocatalytic activity using an RZ ink test. Both PURETi Clean and PURETi Clear greatly outperformed HYDROTECT in this test on both tile and glass surfaces. PURETi Clean applied to a smooth tile surface could not be assessed using the RZ ink test, possibly due to incredibly high activity. Alternate testing with an AV7 ink test revealed the coating to have very high activity.