# A Room with a View

## How switchable glass could make window blinds a thing of the past

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### Background

Electrochromic glazing is an emerging technology which has the potential to transform the way we use glass in buildings.

In an electrochromic window, one of the panes of glass has a coating which enables the glass to change its level of tint in response to a small applied voltage. This means users can switch the glazing to control how much light comes through the window.

The windows can be controlled manually or automatically, with the control settings tailored to the application.

*Electrochromic glass in its fully clear and fully tinted states.*
*(Image courtesy of SAGE Electrochromics)*

### Potential benefits

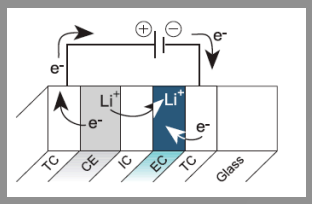
Traditionally, manual window blinds are used to control daylight, but are often left down so that occupants lose the benefits of daylight and views out - this is known as "blinds down, lights on" syndrome.

Electrochromic windows could allow users to control glare from direct sun or bright patches of sky without window blinds, which could enable:

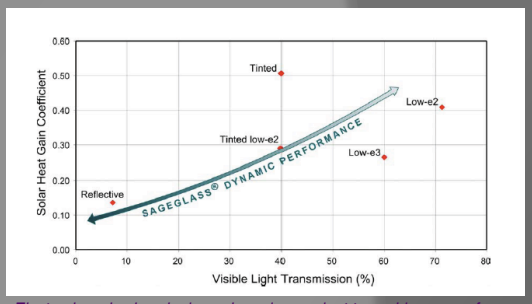
- Users to have more access to natural light
- A view through the window even when the glass is fully tinted
- Reduced overheating
- Reduced electric lighting energy usage

### How it works

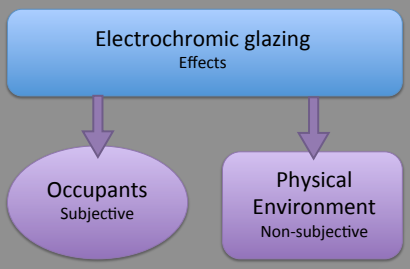
- The electrochromic coating, which is made up of five layers, darkens as lithium ions transfer from the counter electrode (CE) to the electrochromic electrode (EC) layer.
- Reversing the voltage polarity causes the ions and associated electrons to return to their original layer, the CE, and the glass returns to a clear state.
- This solid state electrochromic reaction is controlled through a low voltage DC power supply. It takes less than 5V to switch the glazing.




*Thin film electrochromic stack on glass.*
*(Image courtesy of SAGE Electrochromics)*




*Electrochromic glass is dynamic and can adapt to a wide range of sunlight conditions. Ordinary (static) glazing properties are specific to one condition and cannot be changed.*
*(Image courtesy of SAGE Electrochromics)*




### Research aims

The aim of this study is to assess the impact of electrochromic glazing in an office environment. This can be considered to have two elements:

- The experience of the room occupants (subjective)
- The effect on the physical environment (non-subjective)

The research aspires to answer the question of whether electrochromic glazing without blinds is sufficient to provide visual comfort for users under different sky conditions throughout the year. The study also seeks to establish what other effects might be seen on aspects such as thermal comfort, cooling load and energy usage for electric lighting.

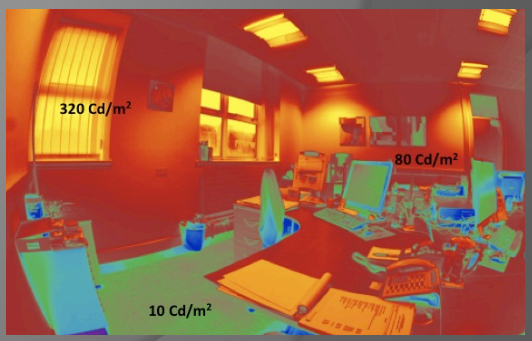
### Methodology

A field study will be carried out in two adjacent open plan offices. The rooms' large southeast-facing windows will be replaced with electrochromic windows. A monitoring campaign will be carried out over a period of approximately 18 months to assess the subjective experience of the room occupants and the effect on the physical environment.

Subjective assessments will endeavour to capture user experience in terms of visual comfort, thermal comfort and well-being, using a combination of interviews, questionnaires and blogs or diaries.

A set of quantitative data will also be gathered to try to capture the impact of the glazing on the physical environment of the offices. Brightness levels in the rooms will be quantified using High Dynamic Range (HDR) imaging. Other quantitative measures will be carried out using temperature sensors and remote monitoring of equipment such as the air conditioning unit and the glazing control unit.

We plan to link all of the above measures with external weather data via a locally sited weather station.




*An example of a HDR image*

### Acknowledgements

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- SAGE Electrochromics Inc.
- Saint-Gobain Recherché

### Key references

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