

An environmental friendly solution for air purification and self-cleaning effect: the application of TiO_2 as photocatalyst in concrete

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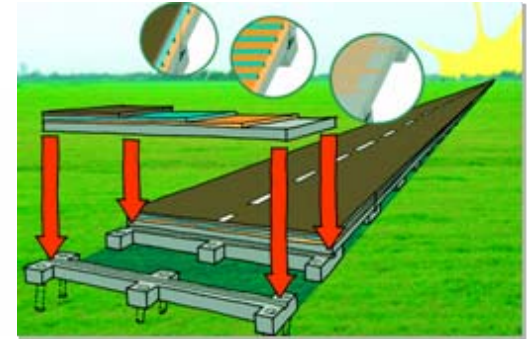
Greener, safer
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Transport Research Arena | Europe 2006

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TRA





Air pollution by traffic

Most important pollutants by traffic

CO : carbon monoxide

SO₂ : sulphur dioxide

NO_x : nitrogen oxide (NO and NO₂)

CO₂ : carbon dioxide

PM : small particles

VOC : volatile organic compounds

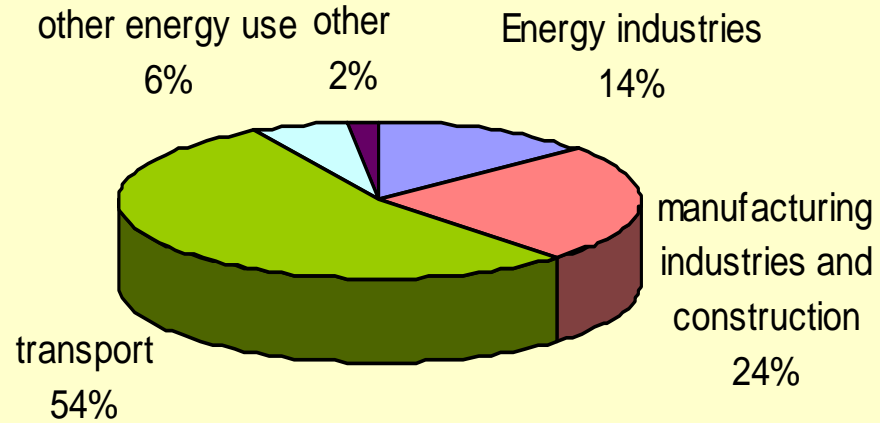
O₃ : ozone (secondary pollutant)

Pb: lead

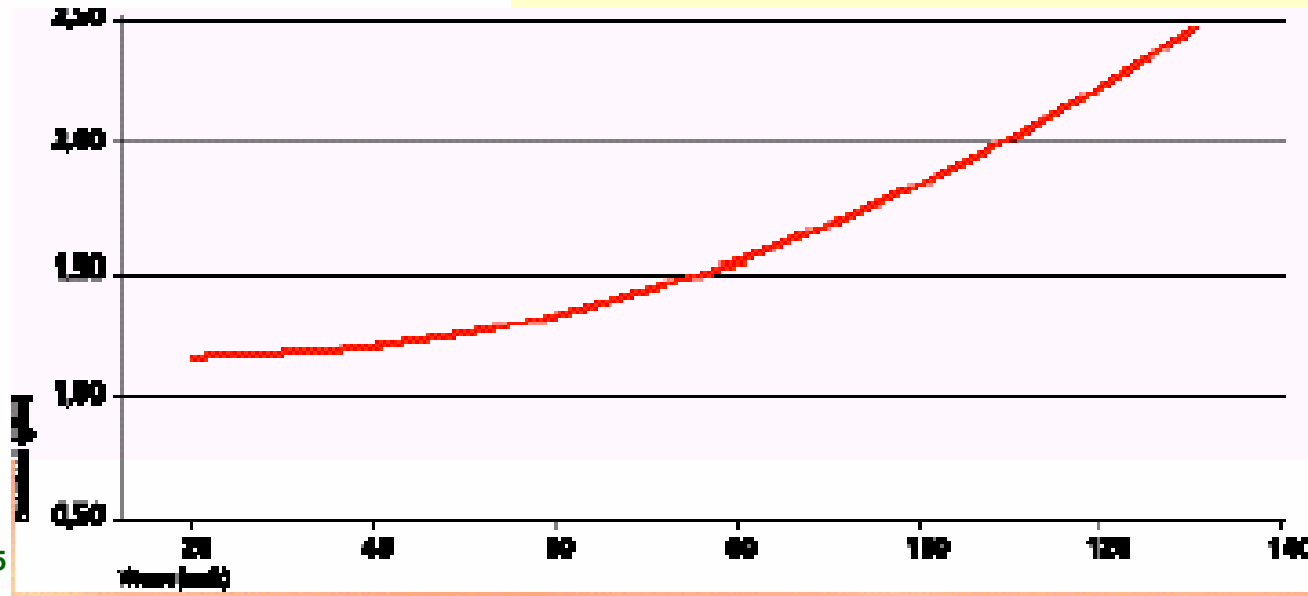


NOx - nitrogen oxides (NO-NO₂)

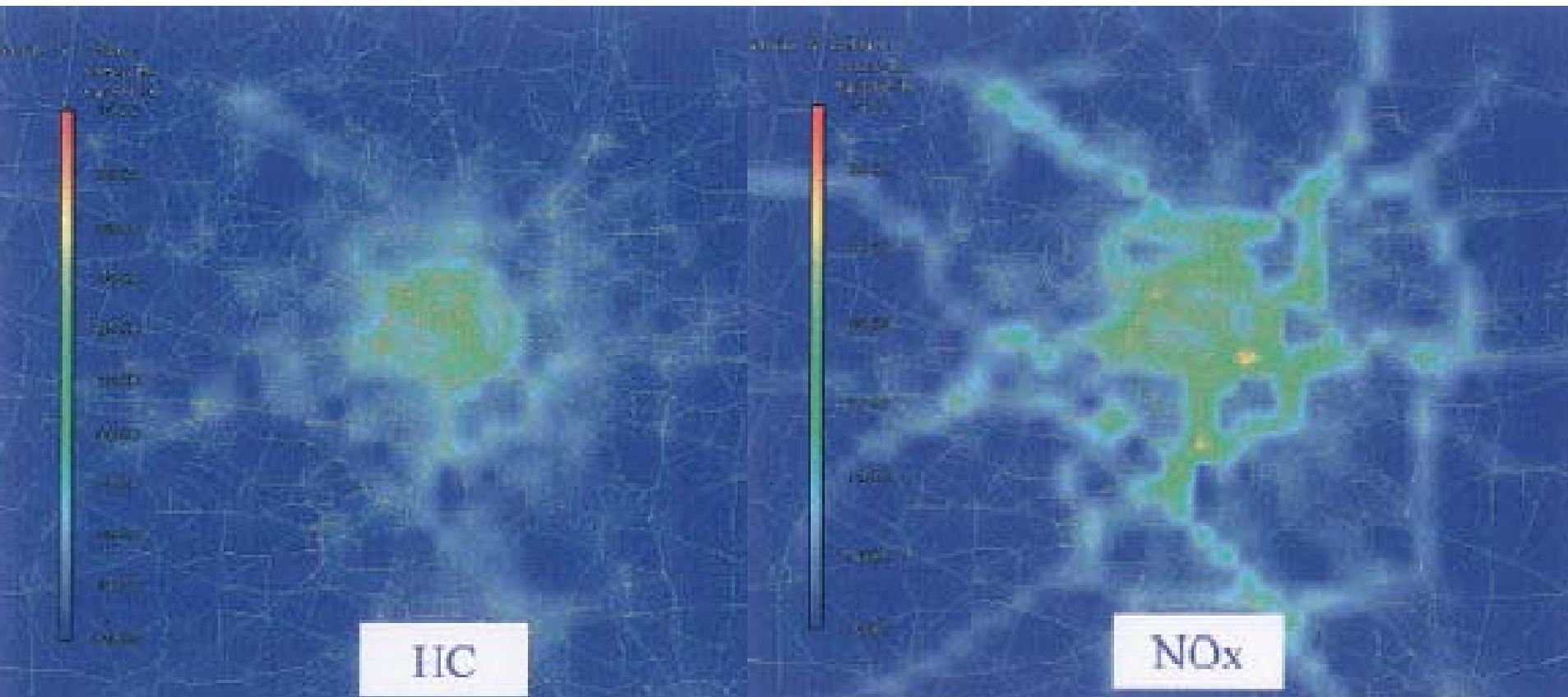
54% from traffic



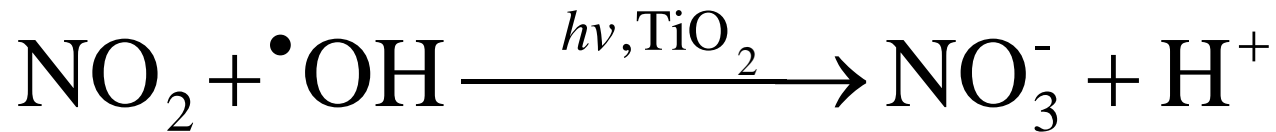
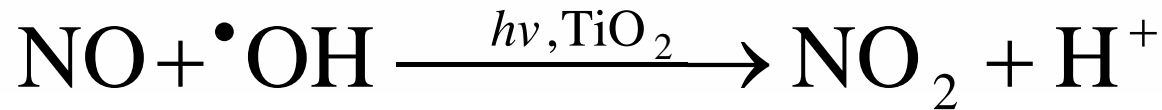
Exhaust increases with increasing speed



Exhaust of HC and NO_x by traffic during rush hour in Paris => risque of formation of ozone and smog



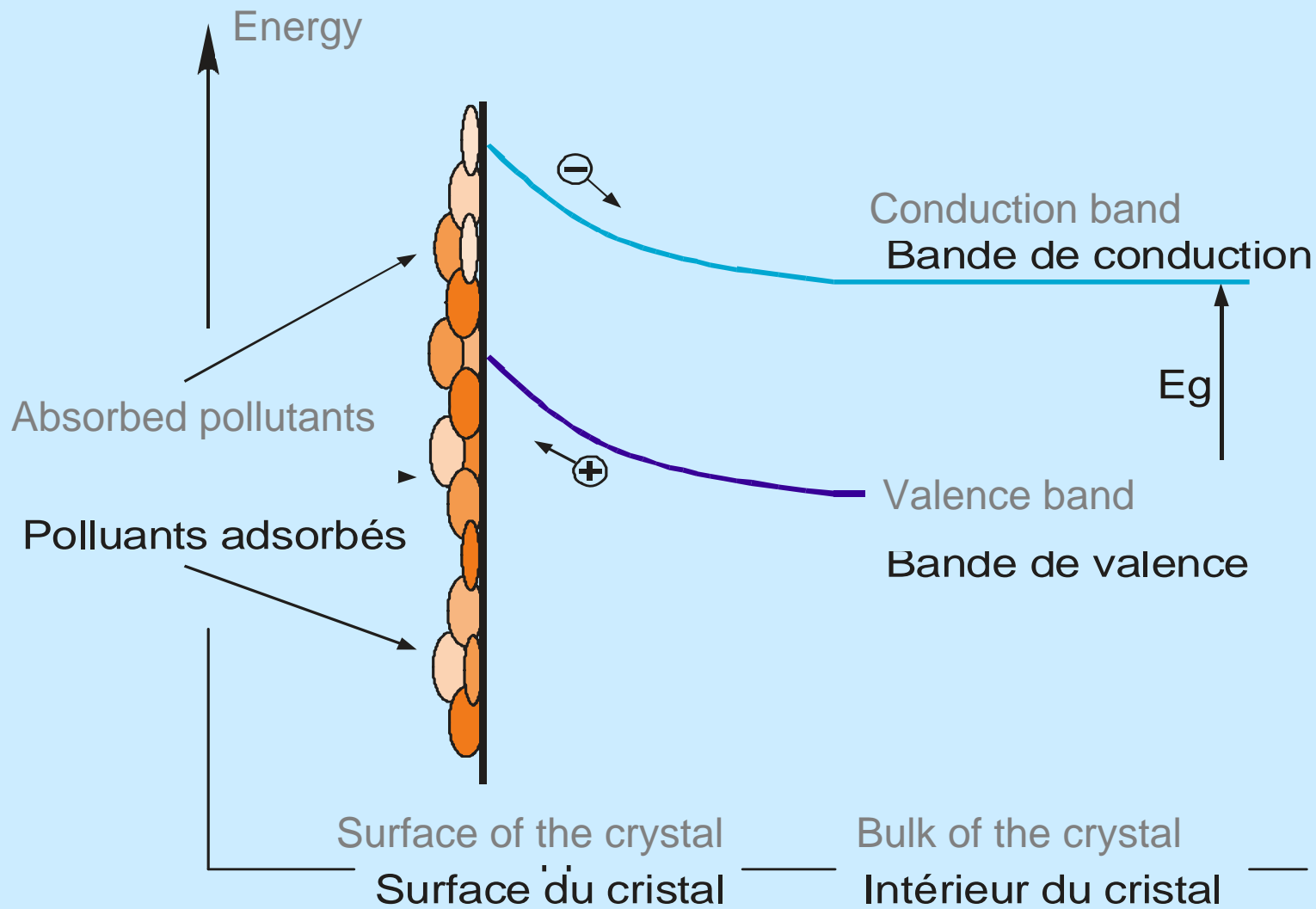
Air purifying action of TiO_2



In presence of UV-light

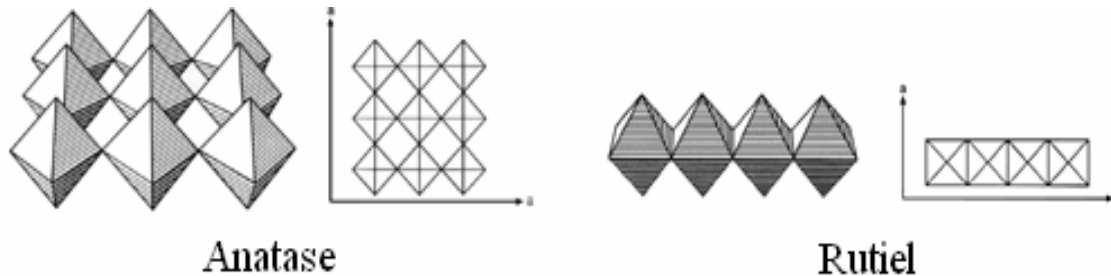
HNO_3 can be flushed away by the rain -
concentration is very limited

Circle through acid rain is closed short, reduced
attack of buildings, reduced influence on
environment, ...



TiO₂ as photocatalyst

TiO₂ as anatase for optimum photocatalytic reactions



Rutile: used as white pigment in paint

Applications of TiO_2 as photocatalyst

Self-cleaning effect, bacterial degradation

- ▶ Glass
- ▶ Lightbrace in tunnels
- ▶ Floors and walls in hospitals

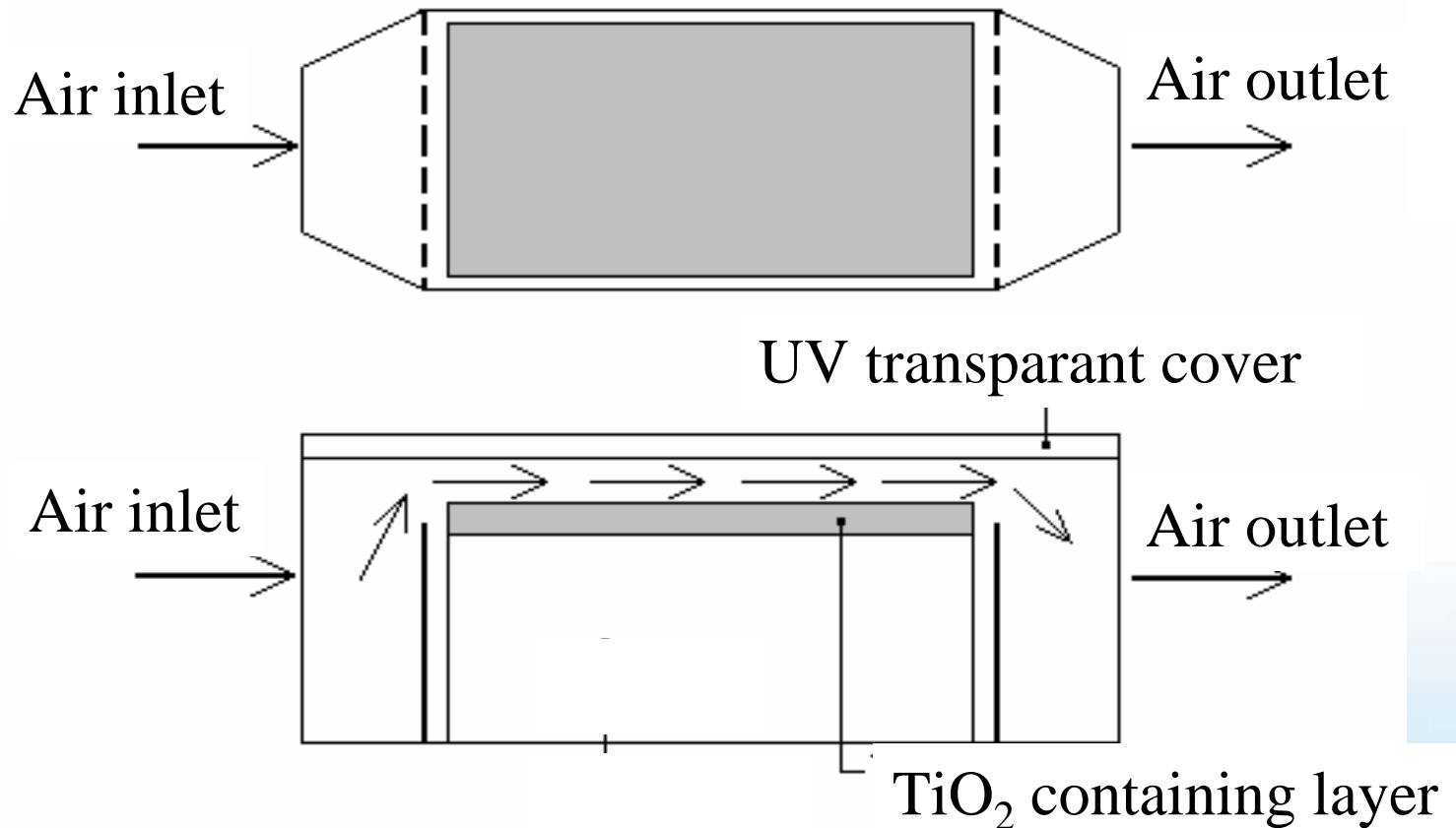
Water cleaning capacity, purification of soil

Air cleaning effect

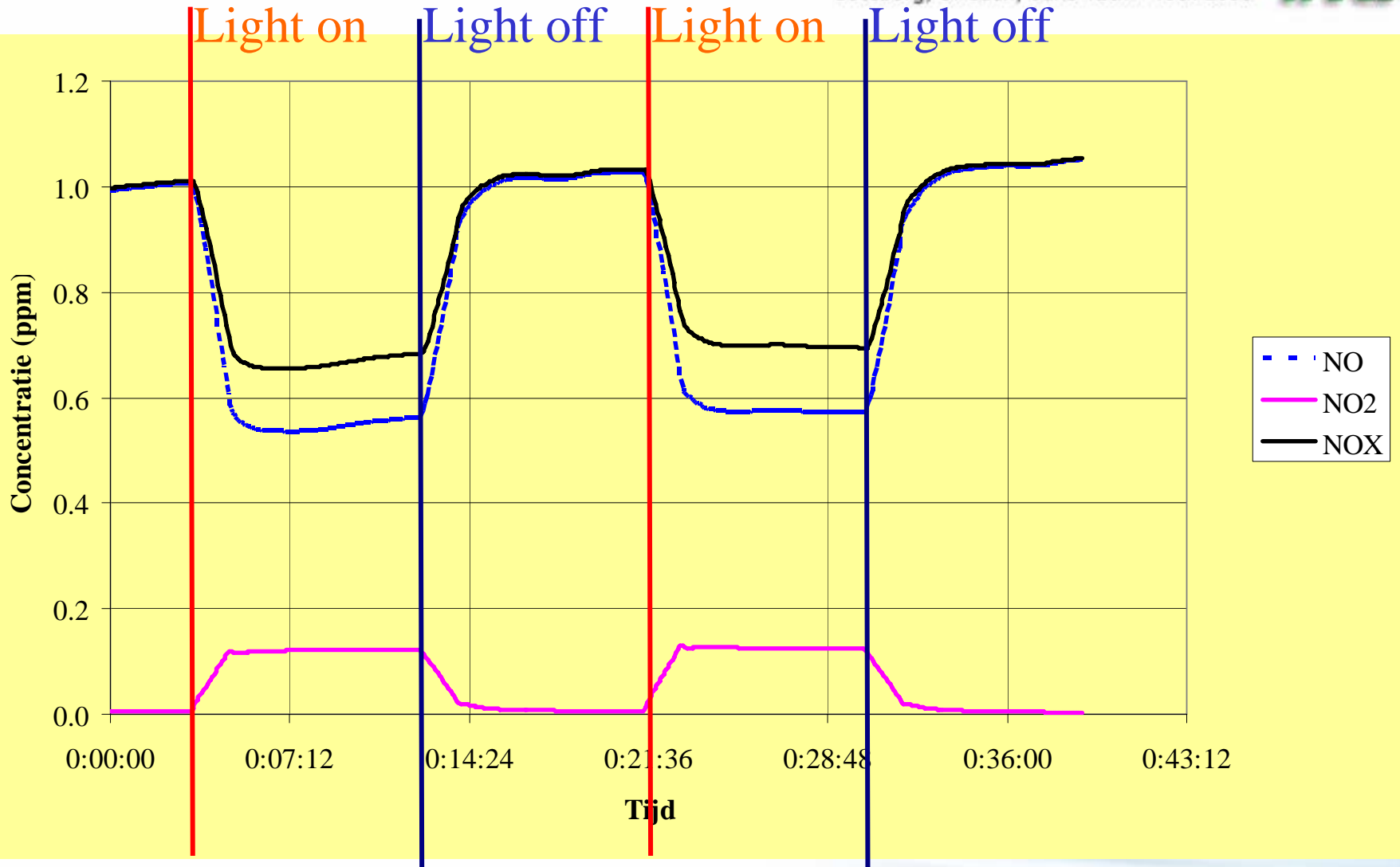
- ▶ Pavement blocks
- ▶ Mineral paints

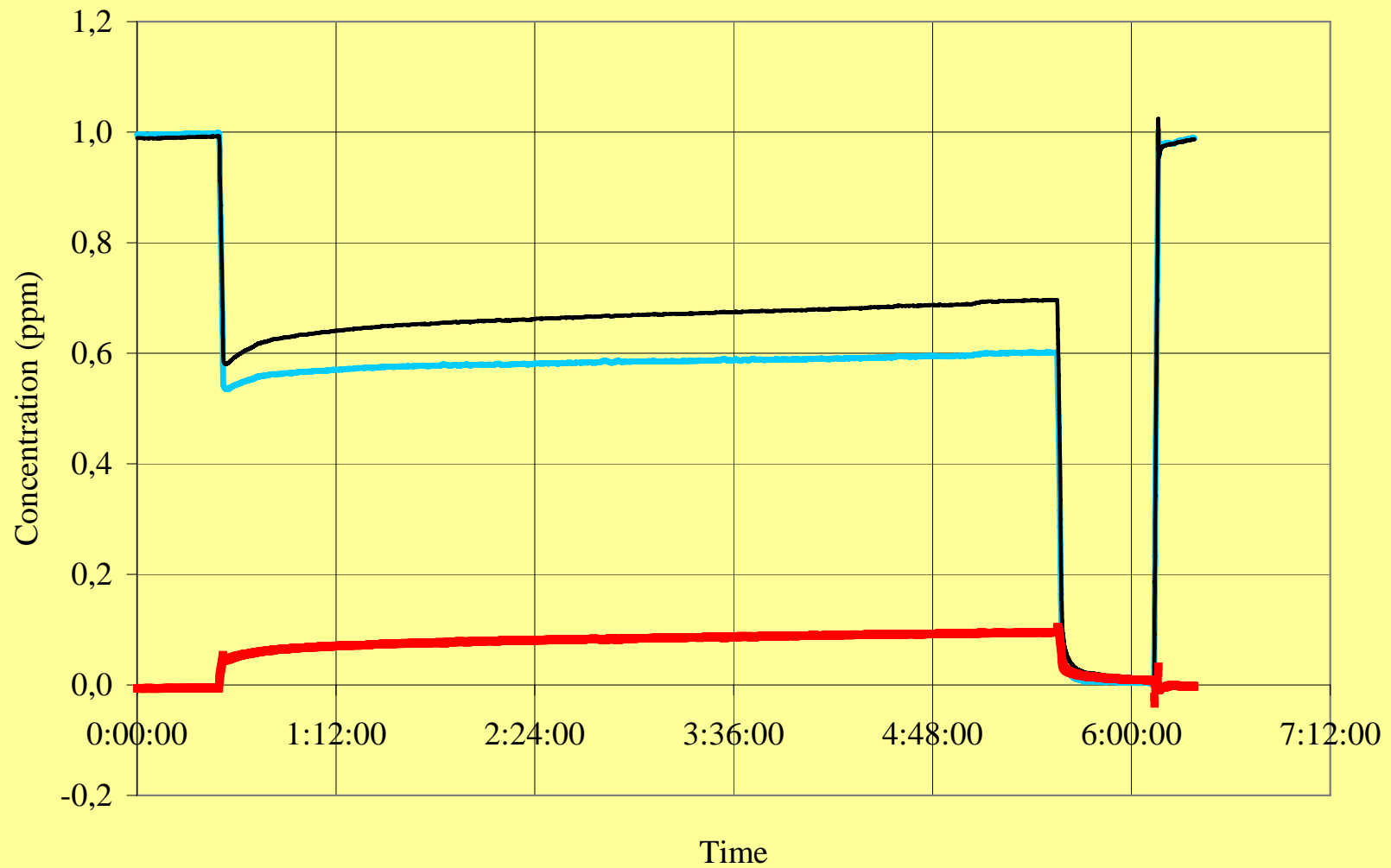


Measurement of air quality: flow over principle



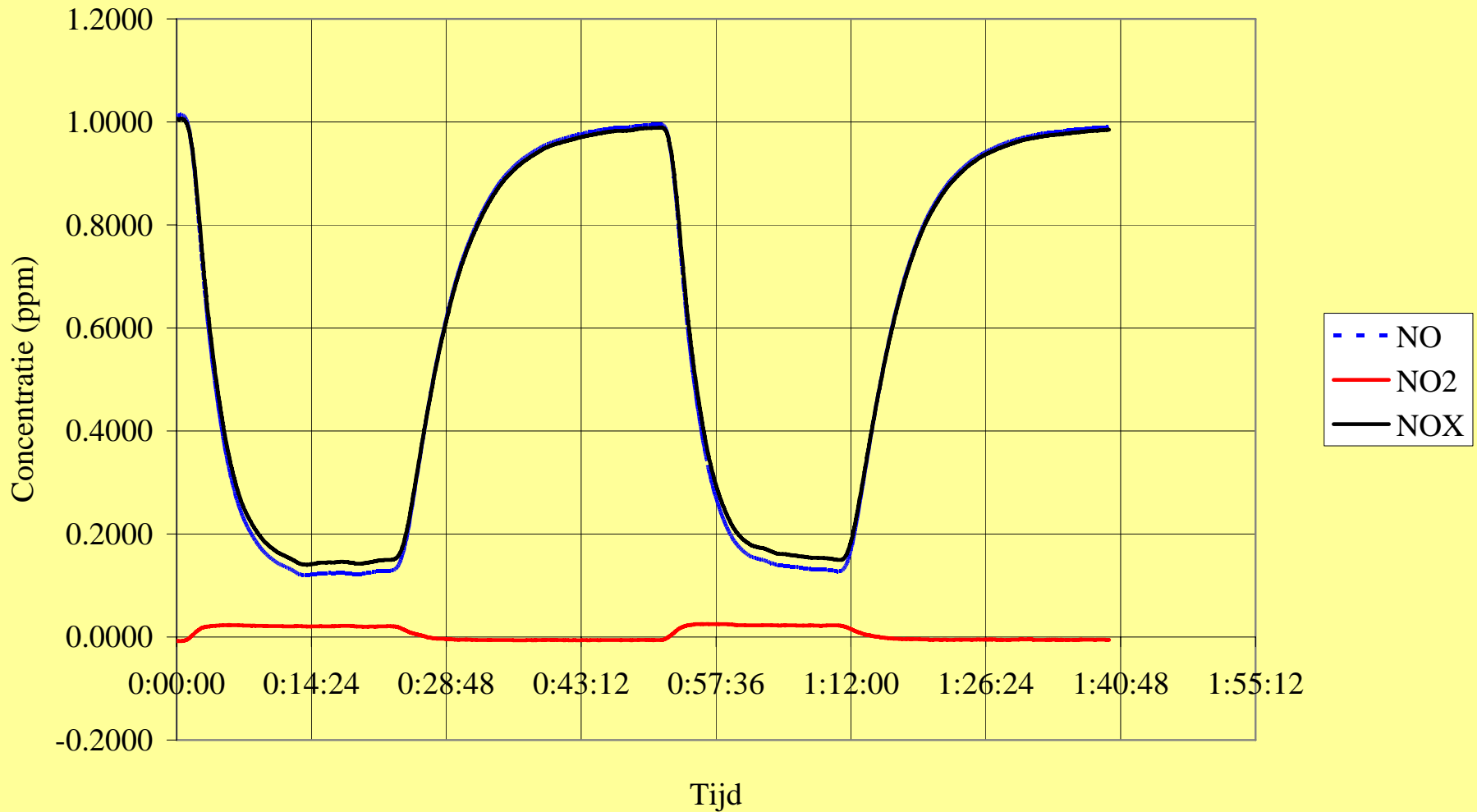








2*3 pavement blocks 30 mm air

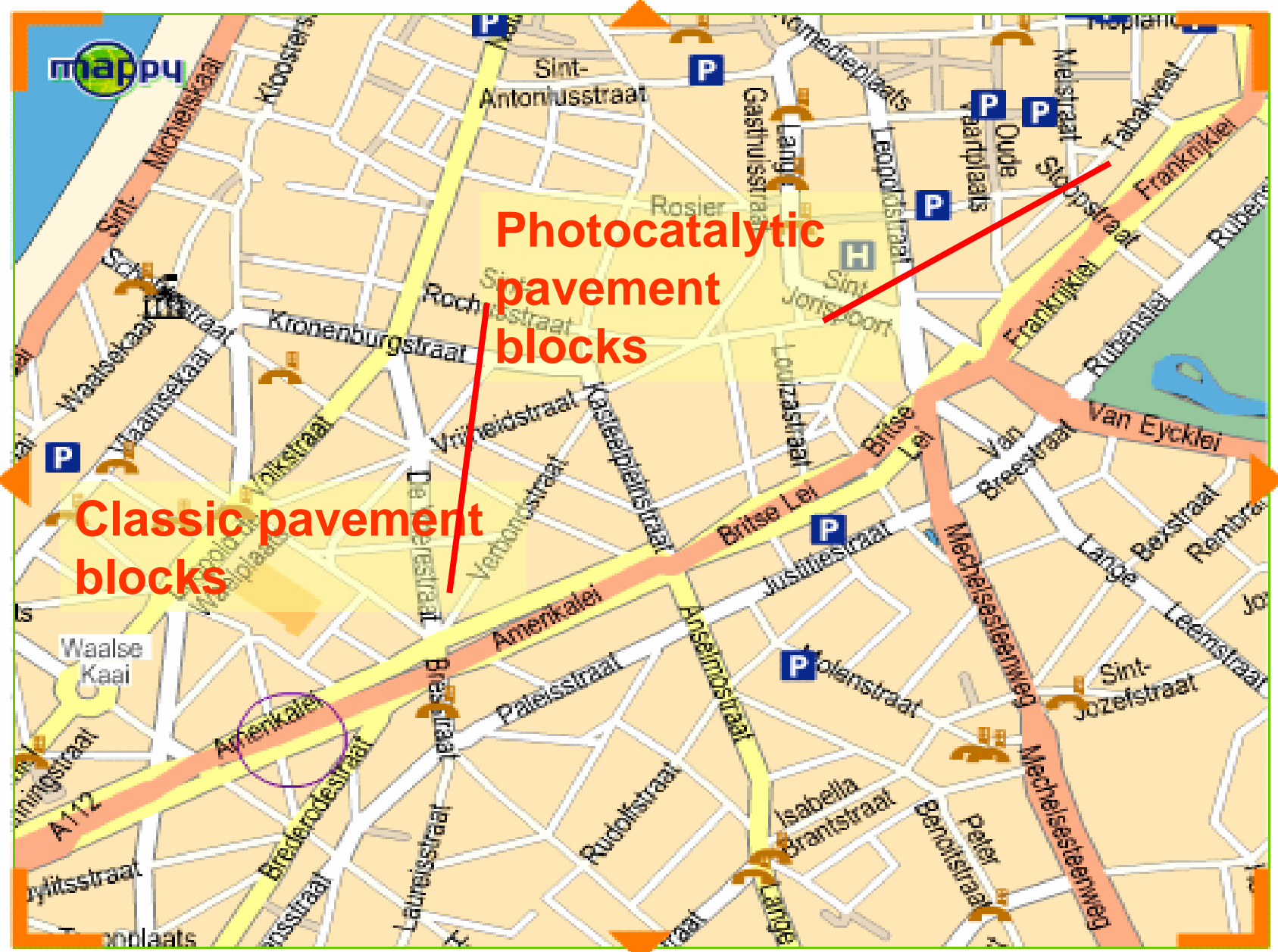


Sideways on the "Leien" - Antwerp



Leien - Antwerp





Conclusion

- Promising results in the laboratory for air purification with photocatalytic pavement blocks: efficiency is increasing with higher temperatures, lower relative humidity and longer contact time
- Translation of results obtained in laboratory towards results in situ in progress
- Durability of the air purification properties is investigated in situ and in laboratory
- Different applications exist: as pavement blocks, as facades of buildings, as noise reducing barriers,...
- Use of new techniques and new materials may lead to environmentally friendly applications in urban environments



Noxer-Mitsubishi



Thank you for your attention!