Environmental Health Committee (EHC) Emerging Issue Brief:

Indoor Passive Panel Technologies for Air Cleaning in Buildings

What is the issue?

Currently, there are many building materials and coating products available in the market that claim to enhance Indoor Air Quality (IAQ) by removing indoor air contaminants. This technology, known as indoor passive panel technology (IPPT), consists of building materials or coatings intentionally designed to remove chemical or biological contaminants without requiring additional energy input beyond normal building operations. IPPT use has the potential to lower airborne pollutant levels at the same time indirectly increase energy saving while increasing energy savings through reducing outdoor air ventilation rates. IPPT manufacturers' claims include energy savings, continuous functionality (for example even after multiple layers of paint coats have been applied), little maintenance (e.g. self-sanitizing; self-cleaning) and improved building occupants' health and productivity.

What does it mean to ASHRAE?

There are several processes involved in the removal of indoor contaminants using IPPTs. These processes include sorptive based IPPTs and photocatalytic oxidation (PCO) based IPPTs. Sorptive based IPPTs rely on adsorption and chemisorptions processes while PCO based IPPTs rely on the use of photocatalysts coated on building materials that it irradiated with either ultraviolet or indoor light. Literature on performance of these technologies has documented potential issues associated with their use, which include:

- Re-emissions of captured gaseous contaminants;
- Low effectiveness of PCO based products' performance under real-life conditions (e.g. PCO based technology traditionally rely on UV light irradiance which is very low in indoor environments);
- Surface treatment (e.g. paint, prime, wallpaper) or particle soiling on IPPT surfaces may diminish? performance;
- Generation of harmful by-products (e.g. formaldehyde, ozone) for PCO based products.
- Impact of variations in environmental conditions or performance conditions

There is a lot of potential for impact considering that IPPT can be used in a broad range of building materials within the built environment. It is unclear if this impact can be positive or negative for IAQ and the occupants' health.

Currently, there are inadequate information to evaluate actual performance of IPPT in indoor environments. Available standards to assess the performance of the two types of IPPT technologies have focussed on evaluating removal performance of selected airborne organics using small specimens in small chambers and using UV light sources (not visible light sources). Of additional interest to the field of IAQ and ASHRAE, the marketing of IPPT as an "energy efficient solution" has not been validated by research. There is a potential that the adoption of IPPT as an energy efficient and sustainable approach may prevail over other IAQ solutions (ventilation and air cleaning) that may have positive energy consequences but unknown health impact.

<u>What action item should be considered?</u>

ASHRAE should develop a description of the various applications of IPPT in building materials and coatings, and evaluate their performance indoors. ASHRAE should inform the public about the true performance of various IPPT materials and provide guidance with regards to its safe use in the indoor environments.

ASHRAE should also review and initiate research in this area. For example:

1. A comparison of the effectiveness of IPPT in reducing contaminants of concern indoors compared to their conventional counterpart in air cleaning technologies (e.g. in-duct or portable air cleaners), and evaluate the impact on energy use in buildings in controlled chamber studies as well as field studies.

2. Determine the effectiveness of PCO based IPPT using typical indoor lighting sources (e.g. fluorescent, LED) and evaluate by-product formation (e.g. ozone, formaldehyde).
3. Compare the performance of IPPT in removing indoor contaminants in small chamber experiments with large chamber or in-situ performance in real buildings.
4. Evaluate the IPPT performance using test samples that replicate their use for real indoor environment applications (e.g. using samples that are painted or installed with wallpaper).
5. Evaluate the IPPT performance in different environmental conditions.