Reducing the Environmental Impact of Roofing Shingles

Kusher, Jesseca

Today 5% of the United States's total energy consumption comes from air conditioner use at a cost of $11 billion and a release of 100 million tons of carbon dioxide into the atmosphere annually (EPA, 2013). This energy consumption may be due to the low albedo of asphalt in high density urban environments or "urban heat islands." Such areas produce ozone, an anthropogenic pollutant that has been demonstrated to negatively affect human physiology. The present study illustrates the development of new, inexpensive, naturally based, reflective coatings that when applied to roofing shingles decreases the heat absorbed by asphalt roofs. As seen in this study from Graphic Imaging Systems (GIS), there is a correlation between urban population centers and ozone production. Three powdered minerals were examined as they could be added to a clear, acrylic-based sealant and painted on the shingles: graphite, mica, and gypsum. All are common in the United States, are commercially available, and are used in various industries for their reflective properties. The treated shingles were exposed to simulated summer sunlight conditions and all three minerals significantly decreased the maximum temperature attained. Significant to this project was that the mica and gypsum treatments did not alter the coloration of the shingles; while graphite did darken the shingles, nonetheless all three treatments show potential for future application onto roofs to mitigate the effects of urban heat islands.

Awards Won: