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Investigation of the Highly Effective Adsorption of Toxic Heavy Metals in Sweat through Multiple Fabric Layers

Sweat is absorbed into fabric which is worn next to skin such as underwear. Moisture transfer through fabrics have been studied by many researchers to invent more comfortable microclimate garments. However, there is no scientific literature reported any behaviour of elements in sweat from the point of surface science during sweat moisture transfers through fabric layers. This work for the first time has attempted to understand the effect on the property of commodity fabrics as multiple layers with the heavy metals with moisture absorption effect. A complete understanding of the mechanism may provide a key to obtaining optimum performance for a particular application.

This study shows that heavy metal indeed transfer from the substrate (a wet skin with artificial sweat including a heavy metal) to upper fabric layers and the concentrations of heavy metal ions differing degrees in each layer using laser desorption ionization mass spectrometry (LDI-MS) and secondary electron microscope (SEM). Some combinations of the fabrics indicated highly effective adsorption of heavy metals, more heavy metal ions were observed being preferentially remained on the top layer of particular sets of different fabric assemblies than others. They have no significant correlation with the standard moisture regain. This indicates that specific combinations of different fabric layers enhance molecular absorbency rather than single material layers although each fabric possesses no particular function to absorb purposely. The results may lead a novel invention as adjunctive remedy and/or an additional method for monitoring bioaccumulation of toxic elements in humans.

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