

Biomimetic method to create new transparent and emotion-responsive biomaterials and their use in architecture and design

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Transparent materials play a major role in Architecture, especially concerning the relation between outdoor and indoor spaces. The range of materials used in recent years have focused on glass and synthetics, while Nature has far more to offer. The biomimetic approach is an ideal way to create transparent materials though the transparency in Nature is often not based on material, but on structure. The results of this projects research will be used to develop biomaterials on a structural level and solve current issues in Architecture. In their natural environment animals use transparency in different ways, either for protection or for the maximization of their given abilities. The transparent features of these animals are analyzed on nanoscale level with casting methods, these being fast, easy, reliable and up-scalable for further use, selection and comparison. The main object of research in this case is *Greta oto*, which has mainly transparent wings. The analysis of the nanostructural functionalities of both the transparent and the non-transparent wing parts shows that also in this case it is the underlying structure, which is responsible for the transparency. Within our research the transmission of light based on the structural nanoscale level is also studied. Due to the change of these structures light frequency regulation is possible. The understanding of this mechanism allows us to create biomaterials, which can be adapted to specific needs. Examples for this are bird protective glass, being visible for birds due to specific lightwaves, yet invisible for the human eye, or UV-light protective glass, which acts as a filter on nanoscale level. Changes in the surface structure can also lead to antireflective or selfcleaning materials. Furthermore, our research results can be applied to fields other than Architecture, focusing on the design aspects of surfaces, textures, and others. The previously mentioned structures can induce user defined waterflows. This can be used as a hidden artistic element, which appears with rainfall. Apart from these improvements a biomimetic approach can be used for the development of completely new materials. An example for this would be the display of emotions on surfaces and textiles. The underlying mechanism would be a receptor material, which reacts to certain compounds in the air and changes its characteristics depending on their concentration. The display of the biomaterials color change, for example, can indicate rooms in case of toxic contamination, outbreak of fire, domestic violence or high stress, this being a new warning system, visible to the outside.