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Introduction to the Symposium

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Introduction to the Symposium

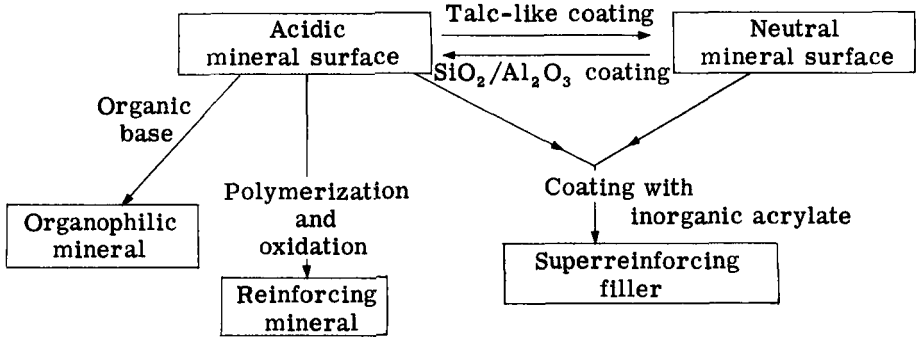
The past few years have witnessed major developments in the general area of polymer composites. Much attention has been paid to the selection of the composite components, and many detailed studies have been aimed at improving our understanding of the reactions at the mineral polymer interface.

In the past, pigments and fillers used in composites have been broadly classified into two types; the fine particle size "reinforcing" types which greatly enhance the mechanical properties when used in composites, and the "inert" or larger particle sized materials, such as clays, which may degrade some mechanical properties. Significant advances have been made in our understanding of the manner in which carbon black acts in elastomers, and these findings have provided theories which can be used to design surface modifications for pigments or fillers of larger particle size. This work has been accelerated by reports that cheap fillers, after suitable surface modification, could improve the mechanical properties of polyethylene, and by results which have established that under the conditions used in processing many polymer composites, strong chemical activity can be associated with fillers such as clay.

Our own work has shown that under the conditions encountered in processing elastomers and thermoplastics, aluminum silicates, such as clay, became strongly acidic, whereas magnesium silicates, such as talc, are at most only weakly acidic. This difference in acidity is reflected in many properties, including those of the final composition.

An extension of this finding has been to coat various minerals with a talc-like or clay-like layer by precipitation of the magnesium or aluminum silicate onto the surface. Development of this concept into useful commercial pigments/fillers will be discussed with particular reference to titanium dioxide and to clays. These represent the extremes: titanium dioxide is the major white pigment and is expensive, clay is often only an extender pigment or filler and is cheap.

These developments, each of which will be discussed in a separate paper, can be summarized as follows:



Because many of these developments have been influenced by findings from the elastomer field, it seems appropriate to commence the symposium by a review of the action of carbon black, then to proceed to a discussion of flocculation and polymeric dispersants, and finally to present the papers on modifications aimed at improving the mechanical properties of composites containing pigments and fillers.

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