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Chemical Characterization of Dust Deposition in an Arid Environment

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Dust can impact the efficiency of solar energy collection devices and in some arid environments, dust can reduce solar energy efficiency up to 30%. Reducing the impact of dust is critical in the expansion of solar technology throughout regions where solar energy is utilized. Characterization of suspended particulate can assist in developing strategies for dust mitigation. With the characterization of suspended particulate in remote, rural and urban environments, more informed decisions can be made regarding the selection of coating material on solar panels and in developing cleaning and maintenance procedures. Particulate matter that deposits on a solar surface can potentially interact with solar radiation, precipitation or even directly with the surface material itself. These interactions could lead to the formation of compounds that reduce/block radiation and/or degrade the integrity of the surface. Preliminary characterization of dust could play a vital role when planning the construction of a solar energy facility.

A variety of sampling techniques were employed to obtain particulate matter for characterization. These included direct collection of suspended airborne particulate from solar surfaces, tacky dot slides, desert vugs as well as high volume air sampling. High volume air sampling was performed using glass fiber filters and 2 micron stainless steel. Direct collection was performed by sampling from a solar surface, a vug, or by collection onto a glass surface. Collection onto glass surfaces was achieved by setting up a plane microscope slide, a tacky dot slide, and normal pane of glass.

The sampling methodology allowed for the collection of samples for analyses using various analytical methods that included raman microspectroscopy, pyrolysis gas phase-chromatography, ion chromatography and scanning electron microscopy. These various methods will allow for identification of organic and inorganic components as well mineral distribution of suspended particulate material.

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