



Physical Sciences

Method for Measuring the Volume-Scattering Function of Water

Goddard Space Flight Center, Greenbelt, Maryland

The volume scattering function (VSF) of seawater affects visibility, remote sensing properties, in-water light propagation, lidar performance, and the like. Currently, it's possible to measure only small forward angles of VSF, or to use cumbersome, large, and non-autonomous systems. This innovation is a method of measuring the full range of VSF using a portable instrument.

A single rapid-sensing photosensor is used to scan a green laser beam, which

delivers the desired measurement. By using a single sensor, inter-calibration is avoided. A compact design is achieved by using drift-free detector electronics, fiber optics, and a new type of photomultiplier. This provides a high angular resolution of 1° or better, as well as the ability to focus in on a VSF region of particular interest.

Currently, the total scattering of light is measured as a difference from the other two parts of the light budget equa-

tion. This innovation will allow the direct calculation of the total scattering of light by taking an integral of the VSF over all angles. This directly provides one of the three components of the light budget equation, allowing greater versatility in its calculation.

This work was done by Yogesh C. Agrawal of Sequoia Scientific, Inc. for Goddard Space Flight Center. For further information, contact the Goddard Innovative Partnerships Office at (301) 286-5810. GSC-15395-1

Method of Heating a Foam-Based Catalyst Bed

John H. Glenn Research Center, Cleveland, Ohio

A method of heating a foam-based catalyst bed has been developed using silicon carbide as the catalyst support due to its readily accessible, high surface area that is oxidation-resistant and is electrically conductive. The foam support may be resistively heated by passing an electric current through it. This allows the catalyst bed to be heated directly, requiring less power to reach the desired temperature more quickly. Designed for heterogeneous catalysis, the method can be used by the petrochemical, chemical processing, and power-generating industries, as well as automotive catalytic converters.

Catalyst beds must be heated to a light-off temperature before they cat-

alyze the desired reactions. This typically is done by heating the assembly that contains the catalyst bed, which results in much of the power being wasted and/or lost to the surrounding environment. The catalyst bed is heated indirectly, thus requiring excessive power. With the electrically heated catalyst bed, virtually all of the power is used to heat the support, and only a small fraction is lost to the surroundings.

Although the light-off temperature of most catalysts is only a few hundred degrees Celsius, the electrically heated foam is able to achieve temperatures of 1,200 °C. Lower temperatures are achievable by supplying less electrical power to

the foam. Furthermore, because of the foam's open-cell structure, the catalyst can be applied either directly to the foam ligaments or in the form of a catalyst-containing washcoat. This innovation would be very useful for heterogeneous catalysis where elevated temperatures are needed to drive the reaction.

This work was done by Arthur J. Fortini, Brian E. Williams, and Shawn R. McNeal of Ultramet for John Glenn Research Center.

Inquiries concerning rights for the commercial use of this invention should be addressed to NASA Glenn Research Center, Innovative Partnerships Office, Attn: Steve Fedor, Mail Stop 4-8, 21000 Brookpark Road, Cleveland, Ohio 44135. Refer to LEW-18155-1.

Small Deflection Energy Analyzer for Energy and Angular Distributions

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The development of the Small Deflection Energy Analyzer (SDEA) charged-particle spectrometer for energy and angle distributions responds to a long-standing need to measure the wind velocity vector in Earth's thermosphere, and to obtain the ion-drift vector in the ionosphere. The air and ions above 120 km are endowed with bulk velocities and tem-

peratures just like air near the ground, but with separate spatial and temporal variations. It is important to understand these not only for study of the physics and chemistry of the Sun-Earth connection, but also for spacecraft orbit predictions, and communications through the ionosphere.

The SDEA consists of a pair of parallel conducting plates separated by a small

distance, with an entrance slit on one end, and an exit slit on the other. A voltage applied to these plates develops an electric field between the plates, and this field deflects ions passing through it. If an ion has too little energy, it will strike one of the plates. If it has too much, it will strike the back wall. An ion with the amount of energy being searched for