ENZYME BASED MEMBRANE REACTOR FOR CO_2 CAPTURE

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ABSTRACT

Control of carbon dioxide (CO_2) is crucial for all crew inhabited space-flight missions. Management requires safe and reliable CO_2 extraction systems. Historically such systems have been relatively costly to operate. This is due to high consumable materials usage rates (e.g., LiOH), high mass and/or volume (solid amines), and/or high energy costs associated with regeneration of CO_2 adsorption capacity (e.g., metal oxide). More economical operation is needed for the ISS and is of critical importance for longer duration missions (e.g., Mars). Thus, there is an ongoing need for development of improved technologies for CO_2 capture. As is always the case, all technologies must provide a sub-system that is safe and reliable, that improves on existing technology, that has a small volume, low mass, low rate of energy use, minimal use of consumables, and needs little or no crew time for operation and maintenance. To these ends we are working to complete the development of a highly efficient Carbonic Anhydrase based liquid membrane biomimetic reactor.

Last year we presented work on our initial findings with regards to use of electrodiffusion to improve reactor performance by increasing the effective transport rate of CO_2 without increasing that for O_2 and N_2 and how alterations in liquid membrane chemistry can be used to improve selectivity. This year, in addition to discussing the final results from the electrodiffusion work (reported at ICES 2002), we will report on more advanced aquatic chemistry and reactive transport modeling, and on our current efforts designed to enhance EBCLM performance through localized pH control.

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