Carbon microbubbles sequestration: a novel technology for stable underground emplacement of greenhouse gases

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A novel economic leak-free underground injection technology of greenhouse gas - the carbon (CO_2) microbubbles sequesrtration- can bring the deep reduction of greenhouse gas emission into reality around the world. The atomized foams of CO_2 gas, CO_2 supercritical fluid or CO_2 liquid are dispersed deep into tiny pores of wide variety of underground rocks for virtually permanent storage. The gas microbubbles injection may be effective also for the EOR and EGR in tight rocks such as oil shale and gas shale. Combined effect of hardly buoyant carbon microbubbles, heavy carbon dioxide solution and various trapping mechanisms makes the carbon microbubbles sequestration stable and leak-free in wide variety of geology. The carbon microbubbles injection is suitable also to small scale sequestration of greenhouse gases in the coming hydrogen society as well as large scale CO_2 storage from big coal-fired power plants.

The dispersion and dilution of CO_2 in large volume of deep groundwater and rocks by scattered relatively small-scale carbon microbubbles injections are an earth-friendly strategy of greenhouse gas sequestration. The flexibility of site selection makes the source-sink matching much easier for the carbon microbubbles sequestration than conventional direct large-scale injection practices. As we can find the suitable site for the storage near of many large sources of carbon dioxide, the carbon microbubbles sequestration is practically energy-saving and cost-effective greenhouse gas reduction method in many regions. The carbon microbubbles injection can produce the reductive geochemical and biological environments in tiny pores of igneous (especially oceanic) rocks and sequestrate CO_2 into carbonates, organics and methane in the similar mechanism to the Early Archaean earth. The autogenous sealing by carbonate trapping and by hydrate trapping provides the leak proof storage of anthropogenic CO_2 in the deep oceanic crust.

The carbon microbubbles sequestration (CMS) provides the economig leak-free option of carbon capture and storage (CCS) and a break-through for the prevention of global warming.