Group 1

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Name of the project: Future prospect and enhancement of Carbon Capture and Storage (CCS)

Abstract: Carbon dioxide (CO_2) has been drawing such huge attention recently due to its impact on rising the earth's temperature and strong driving energy to global climate change. This situation arises from a huge utilization of fossil fuels, which are the main source of total world energy, especially to generating electricity and to working transportations. To fight on CO_2 emission impact, Carbon Capture and Storage (CCS) is one of various approaches that can be nominated as a brilliant technology. CCS system captures the carbon dioxide, transports it to the suitable storage site and finally stores it in a carefully selected area which is typically several kilometers below the earth's surface. However, behind its great deal to reduce CO_2 emission, it is a relatively cost consuming technology and nobody reported that the current CCS technologies have a good efficiency. In addition, potential consequences of failed transporting and storing systems can be the cause of releasing carbon dioxide back into the atmosphere and damaging groundwater and ecosystem. Those terrible drawbacks made this technology to be less useful. However, we believe that Carbon Capture and Utilization (CCU) as an extended system of CCS could be one of a problem solver. The idea is converting the captured-CO_2 into another value-added substance. It will be more profitable rather than just keeping it in the storage system idly. On the other hand, fuel cell technology is one of attractive and useful green technology. By using fuel cells, electricity could be generated from gas. Hereby, we try to come up with an innovative idea of generating fuel cells in the CCU system. Thus, we will have an ultimately green technology. The captured-CO_2 is being fuel source to the fuel cell and later converted into another value-added compounds together with generating electricity. To control the compounds, constructing material for fuel cells necessarily becomes the key parameter. Metal–Organic frameworks (MOFs) are the highest reported surface area materials known. MOFs are self-assembled combinations of metals and inorganic ligands that result in a relatively young class of highly ordered, porous materials. Because of the number of structural and chemical possibilities, high surface area, controlled pore volume, and thermal properties. Therefore, MOFs are promising materials that can be applied into the proposed system since we can generate controllable products from CO_2 conversion. In the end, we believe that the CCS enhancement in this way will have a great impact for a better sustainable industry in the future.