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Development of Chloride Traps Containing Zinc Oxide for Continuous Catalyst Regeneration Type Catalytic Reforming Process

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Net hydrogen off-gas from the continuous catalyst regeneration type catalytic reforming process (CCR process) contains inorganic chlorides. In order to prevent potential problems such as corrosion in the downstream processes, such chlorides are commonly removed by using fixed-bed chloride traps. We have extensively investigated the chloride removal properties of various materials for the chloride traps and have developed effective and practical zinc oxide based chloride traps. Firstly, we found that net hydrogen off-gas from the CCR process contains not only inorganic chlorides but also organic chlorides. Secondly, we found that the widely used activated alumina based chloride traps have the major disadvantages of formation of organic chlorides from inorganic chlorides on the surface and leakage of the organic chlorides to the downstream processes. These organic chlorides may be decomposed by heating and may cause corrosion in the downstream processes. Conversely, we found that zinc oxide based chloride traps have high potential to remove both inorganic chlorides and organic chlorides through the presumptive mechanism that organic chlorides are converted into inorganic chlorides on the surface and are then trapped by reaction with zinc oxide. However, zinc oxide based chloride traps have problems with pellet breakage and pressure drop buildup due to the deliquescence of zinc chloride derived from the reactions of chloride compounds and zinc oxide. To solve these problems, the chemical and physical properties have been improved by appropriate reduction of zinc oxide content and increase of pore volume with addition of porous inorganic materials to increase the contribution of zinc oxide inside pellets to chlorine removal and to enhance zinc chloride retention capacity. Consequently, we developed a new zinc oxide chloride based chloride trap, JCL-1. Demonstration tests of the JCL-1

showed stable operation with effective removal of both inorganic chlorides and organic chlorides without pressure drop buildup or pellet breakage.

Keywords: Continuous catalytic regeneration, Catalytic reforming, Chloride trap, Organic chloride, Zinc oxide

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