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Optimal Selection of Favorable Areas for CO₂ Geological Storage in the Majiagou Formation in the Ordos Basin

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CO₂ geological storage (CGS) technology is currently one of the best choices for large-scale low-cost CO₂ emission reduction in the world, and the primary issue of CO₂ geological storage is the optimization of the selection of favorable areas for CO₂ storage. In view of the insufficient research on the optimization of favorable areas for CO₂ geological storage in the Majiagou Formation in the Ordos Basin, this study aims to determine the boundaries of the CO₂ geological storage area in the Ordos Basin by studying the temperature and pressure conditions, reservoir conditions, structural conditions, caprock conditions, and the salinity conditions of the formation water using a large amount of geological, drilling, geophysical and experimental laboratory data. After the regional boundary of the CO₂ geological sequestration is determined, it can be optimized and CO₂ geological sequestration can be conducted in the areas that have favorable reservoir conditions, are relatively close to CO₂ emission sources, have a high degree of exploration, have an appropriate formation depth and have a small impact on the development of other mineral resources. The results show that (1) the areas suitable for the geological storage of CO₂ in the Ordos Basin are located in the distribution area of the Majiagou Formation in the Tianhuan Depression, except for the missing areas in the central paleo-uplift. The areas to the east of the Baiyanjing-Shajingzi fault, to the north of the northern margin of the Weibei uplift, to the west of the Yellow River fault, and to the south of the Yimeng uplift are suitable for CO₂ geological storage. (2) Based on the three aspects of technology, safety, and economic feasibility, it was determined that the Wushenqi-jingbian-Yan'an karst slope area (I₁) is the best CO₂ geological storage area, and the Yulin-Mizhi karst basin area (I₂) is a favorable area for the geological storage of CO₂ in the Ordos Basin.