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EVALUATION OF MESOPOROUS GRAPHENE OXIDE - TiO_2 NANOCOMPOSITE FOR CO_2 CAPTURE OF THERMAL POWER PLANTS WITH IDEALIZED PSA PROCESS

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Graphene based adsorbent has been introduced as the next generation CO_2 adsorbent by the scholars since 2012. CO_2 adsorption capacity on these adsorbents as an indicator has been reported to evaluate their performance in comparison with other adsorbents in the literatures. This parameter is easily estimated by CO_2 adsorption isotherm data. On the other hand, these indicator doses not present the performance of the adsorbents in their end utilization. Recently, some scholars develop an indicator called the efficiency indicator to evaluate the performance of the adsorbents in the idealized pressure swing adsorption (PSA) process. This new indicator is defined as the amount of captured CO_2 to energy needed for compressing the gaseous mixture in the PSA process. In this study, for the first time, the recent indicator was used to evaluate the performance of CO_2 capture on mesoporous graphene oxide - TiO_2 nanocomposite. This adsorbent was synthesized and characterized by N_2 adsorption-desorption measurements, X-ray diffraction, field emission scanning electron microscopy and FT-IR spectroscopy. Subsequently, the pure single-component adsorption isotherms, including CO_2 and N_2 were measured at 298 K to assess the efficiency indicator of CO_2 capture on mesoporous graphene oxide - TiO_2 nanocomposite for different type of thermal power plant. The CO_2:N_2 binary gas mixtures, including the molar ratio of 5:95, 8:92, 10:90 and 15:85 were considered to calculate this indicator for combined cycle power plant, natural gas-fired steam power plant, heavy oil-fired steam power plant and coal-fired steam power plant respectively. The efficiency indicator of CO_2 capture on mesoporous graphene oxide-TiO_2 nanocomposite was calculated to be 2.136, 1.170, 0.875 and 0.432 tonne/GJ for above mentioned power plants. Besides, the results indicated that CO_2 capture on this adsorbent had the higher efficiency in comparison with other adsorbents, including three-dimensional graphene based porous adsorbent, holey graphene frameworks, thermally treated graphene nanosheets and activated carbon.

Recent Publications

1. **Nazari Kudahi S, Noorpoor A R and Mahmoodi N M (2017) Determination and analysis of CO_2 capture kinetics and mechanisms on the novel graphene-based adsorbents. Journal of CO_2 Utilization 21:17-29.**
2. **Asgari S, Noorpoor A R and Boyaghchi F A (2017) Parametric assessment and multi-objective optimization of an internal auto-cascade refrigeration cycle based on advanced exergy and exergoeconomic concepts. Journal of Energy 125:576-590.**
3. **Noorpoor A R and Rohani S (2016) Thermo-economics analysis and evolutionary-based optimization of a novel multi-generation waste heat recovery in the cement factory. Int. Journal of Exergy 21:405-434.**
4. **Noorpoor A R and Nazari Kudahi S (2016) Analysis and study of CO_2 adsorption on UiO-66/graphene oxide composite using equilibrium modelling and ideal adsorption solution theory (IAST). Journal of Environmental Chemical Engineering 4:1081-1091.**
5. **Noorpoor A R and Nazari Kudahi S (2015) CO_2 emissions from Iran's power sector and analysis of the influencing factors using the stochastic impacts by regression on population, affluence and technology (STIRPAT) model. Journal of Carbon Management DOI: 10.1080/17583004.2015.1090317.**

Biography

Alireza Noorpoor was born 1974. In 1992, He moved to Mazandaran University for BSc in Mechanical Engineering (Fluid Mechanics) and graduated BSc in 1996 as top student of department. He continued in M.Sc. from 1997 to 1999. He has completed his PhD at the age of 30 years from Iran University of Science and Technology (IUST) and started to teaching at IUST. In 2010 he moved to University of Tehran. Now, he is associate Professor of Graduate Faculty of Environment at University of Tehran. He is the head of Air Pollution and Energy Systems Research Group (FANPAYA Co.) and Editor-in-Chief Journals: Solar Energy Research (JSER) and Environmental Sciences Studies (JESS). His interest fields are: Computational Fluid Dynamics (CFD), Air Pollution, Bio-gas, Carbon Capture and Energy Systems Engineering. He has published more than 200 papers in journals and conferences. He has held more than 10 International conferences at University of Tehran.

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