Biogas Upgrading with the aid of Novel Polymeric Adsorbents

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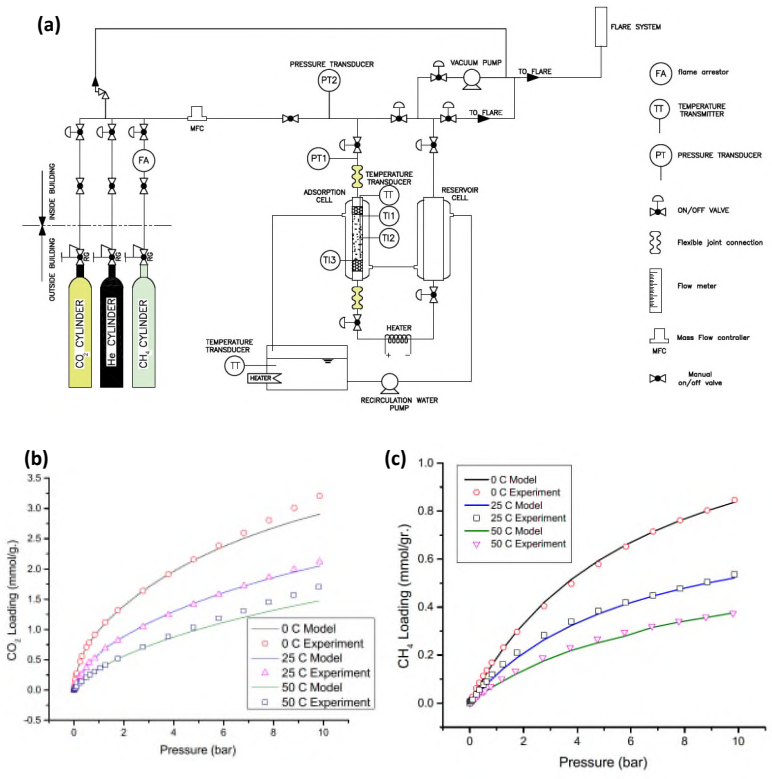
Introduction

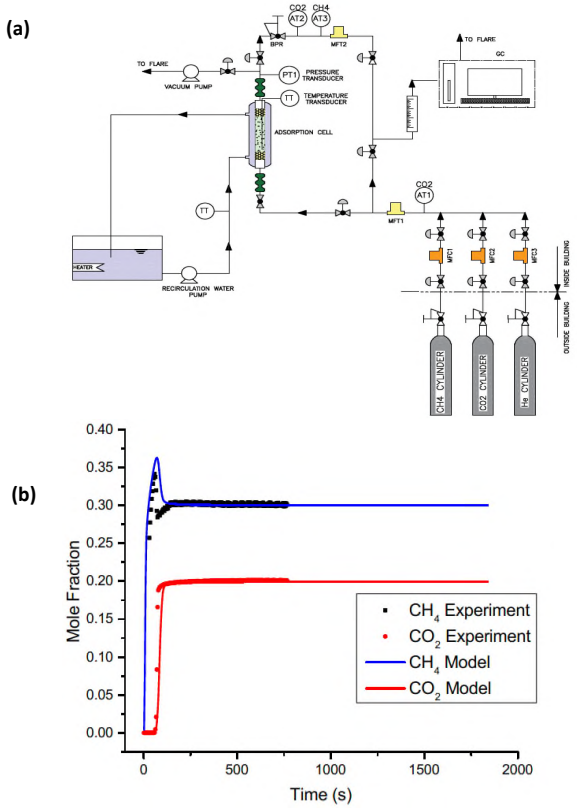
Biogas is a renewable source of energy which will play an important role for energy supply in near future both in heat and electricity form. The biogas is composed mostly of carbon dioxide (CO_2) and methane (CH_4) . Some new polymeric adsorbents have been developed for biogas upgrading [1-3]. For measuring the performance of these polymeric adsorbents, 3 rigs are going to be built. First rig measures the isotherm data. Second rig is used for measuring the mass transfer coefficients (MTC) of each gas and third one is a pressure swing adsorption (PSA) rig to be used for cyclic tests with adsorbents. In this study, we investigate the applicability of these novel adsorbents for biogas upgrading in cyclic swing adsorption processes.

1. Building Static Rig for Isotherm Measurement



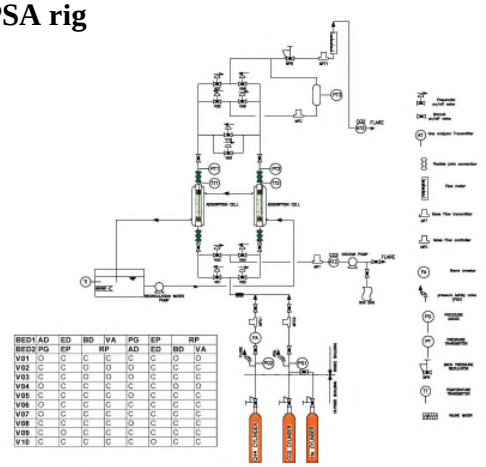
(a) Static rig (b) CO_2 Isotherm (c) CH_4 Isotherm on polymeric adsorbents

2. Building Dynamic Rig for MTC Measurement



(a) Dynamic rig for measuring MTCs (b) dynamic breakthrough curve for a mixture of He (50%) / CO_2 (20%) / CH_4 (30%)

3. PSA rig



Schematic of PSA rig for biogas upgrading

Conclusions

- The linear behaviour of adsorbent for CO_2 confirms the adsorbents can be used for a PSA process. All the current cyclic swing adsorption units are vacuum swing adsorption (VSA) which confirms the vacuum is mandatory for biogas upgrading for current adsorbents; therefore, adsorbents capable of working at PSA units are highly demanding.
- The zero concentration of CO_2 at the beginning of adsorption confirms the adsorbent tendency for CO_2 is much higher than CH_4 and pure CH_4 is obtained in the product.
- The PSA rig will be used for testing of adsorbents in longer series of cycles.

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