

Sn o.	Text data
1.	<p>Abstract: Carbon dioxide (CO<sub>2</sub>) capture technology is a prominent way to mitigate global climate change originating from the excessive emission of greenhouse gas CO<sub>2</sub>. The structural modification of adsorbents with amine is a new attractive strategy to enhance their CO<sub>2</sub> adsorption efficiency under low pressure. The current work is looking to boost the CO<sub>2</sub> uptake performance of Zeolitic imidazolate framework-8 (ZIF-8) impregnated with aminoethylethanolamine (AEEA) inside the porous network of crystalline ZIF-8 nanoparticles via the wet functionalization process due to the enormous surface area and remarkable thermally and chemical stability of ZIF-8. The parent ZIF-8 and amine incorporated ZIF-8 adsorbents were carefully synthesized and characterized by various approaches through HRXRD, Micro Raman, FTIR, FESEM, TEM, EDS, TGA, XPS, BET, and CHNS methods. The CO<sub>2</sub> capture behaviour of materials was examined using the iSorb HP2 adsorption equipment under pressure and temperature swing circumstances, particularly within the spectrum of 0 to 30 bar and 25 to 80 °C. Response surface methodology (RSM) based on the Box-Behnken design (BBD) was exploited to design experiments and investigate the optimum conditions for the desirable response i.e. CO<sub>2</sub> adsorption performance, which was affected by three distinct variables: temperature, CO<sub>2</sub> partial pressure, and AEEA loading. Additionally, the CO<sub>2</sub> adsorption was mathematically modeled using numerous isotherm models. The CO<sub>2</sub> adsorption capacity (3.581 mmol/g) of the prime adsorbent 30 % AEEA treated ZIF-8 was highest among the amine incorporated ZIF-8 samples which was 4.15 times higher than that of the pure ZIF-8 material (0.862 mmol/g) at 25 °C/1 bar partial pressure.</p> <p>Conclusion: Not required</p> <p>Doi: <a href="https://doi.org/10.1016/j.seppur.2024.131090">https://doi.org/10.1016/j.seppur.2024.131090</a></p>
2.	<p>Abstract: The rapid increase in atmospheric CO<sub>2</sub> concentrations, driven by human activities, has become a critical factor in global climate change, posing severe risks to sustainable development. Addressing this challenge necessitates substantial CO<sub>2</sub> removal, which demands innovative and efficient technologies. Carbon dioxide adsorption on porous materials is a promising strategy to mitigate this issue. This study investigates the synthesis of ordered mesoporous silica MCM-41 (Mobil Composition of Matter-41) by microwave irradiation, a technique that offers significant advantages over conventional hydrothermal methods. By optimizing the synthesis conditions, we produced MCM-41 silica with superior structural properties in just 30 min. Characterization techniques, including X-ray diffraction, FTIR and NMR analysis, N<sub>2</sub> adsorption/desorption isotherms, and transmission electron microscopy, confirmed the formation of well-defined pores and hexagonal channels. Notably, the synthesized MCM-41 exhibited a high CO<sub>2</sub> adsorption capacity of 12.8 mmol g<sup>-1</sup> at 25 °C and 50 bar, outperforming silicas produced via conventional methods and comparable to amine-modified silicas. These</p>

	<p>results highlight the potential of microwave-assisted synthesis to improve CO<sub>2</sub> capture efficiency, offering a promising approach for future carbon capture and storage applications.</p> <p>Conclusion: Not required</p> <p>Doi: <a href="https://doi.org/10.1016/j.seppur.2024.130871">https://doi.org/10.1016/j.seppur.2024.130871</a></p>
3.	<p>Abstract: The utilization of eutectic molten salt technology has emerged as a prominent area of investigation aimed at fabricating a novel carbon material sorbent based on biomass wastes. The adsorption mechanism on CO<sub>2</sub> adsorption remains inadequately elucidated as well. Herein, the biochar fabrication process involving eutectic molten salt method at intermediate-low temperature of 550 °C was successfully achieved and investigated in detail. The impacts of molten salt composition, monomer salt's anion and cation, and pyrolysis parameters were firstly studied on the resulting <b>microporous biochar</b> of 1.8 nm pore diameter and 975 m<sup>2</sup>/g surface area. The optimized conditions are 550 °C, 15 °C min<sup>-1</sup> ramp rate, 120 min holding time, Na<sup>+</sup> cation, NO<sub>3</sub><sup>-</sup> anion, and <b>ternary salt KCl/NaNO<sub>3</sub>/Na<sub>2</sub>SO<sub>4</sub> of 32.5/30.4/37.1</b>. The efficient adsorbent exhibited abundant micropores and a substantial specific surface area, leading to enhanced <b>CO<sub>2</sub> adsorption quantity of 3.75 mmol/g</b> (the calculated capacity is up to 4.54 mmol/g) at pressure state of <b>1.6 MPa</b>. Investigation into key factors, adsorption kinetics, and adsorption isotherm revealed that CO<sub>2</sub> capture by optimal adsorbent predominantly stemmed from micropore filling, van der Waals forces, hydrogen bonds, and Lewis acid-base interactions. This research contributes novel insights into the utilization of biochar adsorbents for CO<sub>2</sub> capture in the realm of industry.</p> <p>Conclusion: Eutectic molten salt as a liquid medium, biochar materials with microporous structure were successfully fabricated by utilizing sawdust as a raw material. In this study, the majority impact factors including ternary salts' components, the anions and cations of individual salts, and pyrolysis parameters were studied for adjusting biochar's specific surface area and pore structure. When employing KCl/NaNO<sub>3</sub>/Na<sub>2</sub>SO<sub>4</sub> as the ternary salt composition at mass ratio of 32.5/30.4/37.1(%), the resulted biochar could reach specific surface area of 974.5 m<sup>2</sup>/g (involving micropore specific surface area of 897.1 m<sup>2</sup>/g) with pore volume of 0.51 cm<sup>3</sup> g<sup>-1</sup> at pore size of 1.8 nm through controlling at pyrolysis temperature of 550 °C, ramping rate of 15 °C min<sup>-1</sup> and holding time of 120 min. In contrast, the pristine BC prepared in absence of the eutectic molten salt has only 34.5 m<sup>2</sup>/g with pore volume of 0.08 cm<sup>3</sup> g<sup>-1</sup>. At CO<sub>2</sub> pressure of 1.6 MPa in a pressure reactor, the adsorption quantity of BC/M/S/T550/R15/H120 on CO<sub>2</sub> was evaluated and can reached 3.75 mmol/g (it is only <b>1.2mmol/g</b> for the <b>pristine BC</b>) at <b>room temperature</b>. The experimental findings aligned well with the pseudo-second-order kinetics and the Freundlich model, while pore structure from macro- to micro-scale and surface properties (functional groups, alkaline sites, etc.) were characterized. A hypothesis mechanism involving micropore adsorption</p>

	<p>filling, van der Waals forces, hydrogen bonds and Lewis acid-base interactions is proposed. This research introduces a novel approach for producing biochar with a substantial micro-specific surface area and holds practical significance for addressing industrial CO<sub>2</sub> emissions.</p> <p>DOI: <a href="https://doi.org/10.1016/j.seppur.2024.129403">https://doi.org/10.1016/j.seppur.2024.129403</a></p>
4.	<p>Abstract: Adsorption is fundamental to many industrial processes, including separation of carbon dioxide from other gases in pre- or post-combustion gas mixtures. Adsorbents should have high capacity and selectivity, which are both intimately linked with surface area, pore size distribution, and surface energy. Porous carbons are cheap and scalable adsorbents, but greater understanding of how their textural properties and surface chemistry affects their performance is needed. Here, we investigate the effect of nitrogen doping on CO<sub>2</sub> adsorption. Microporous carbon foams with large surface area (&gt;2500 m<sup>2</sup> g<sup>-1</sup>) and pore volume (1.6 cm<sup>3</sup> g<sup>-1</sup>) are synthesized, then coated with varying amounts of carbon nitride (up to 17 at% nitrogen) to achieve high CO<sub>2</sub> uptake (25.5 mmol g<sup>-1</sup>) and selectivity (CO<sub>2</sub>:N<sub>2</sub> = 21), whilst also giving insights into the relationship between structure and function. At low pressure (relevant to post-combustion capture), moderate carbon nitride loading leads to enhanced uptake and selectivity by combining large ultramicro pore volume with the introduction of Lewis base sites, leading to high isosteric heat of adsorption. Higher carbon nitride loading further increases selectivity but lowers uptake by blocking micropores. Conversely, at high pressure (relevant to pre-combustion capture) the uncoated carbon foam displays superior uptake, because mesoporosity is the dominant factor in this regime, rather than the presence of ultramicro pores. Finally, the samples displayed excellent regeneration under repeated adsorption–desorption cycles, and breakthrough curves were measured. These results underscore the delicate balance required for optimal material design when applying porous carbon adsorbents to CO<sub>2</sub> separation processes. Moving forward, improved adsorbents will contribute to the proliferation of carbon capture and storage (CCS) and carbon capture and utilisation (CCU) technologies, ultimately contributing reduced anthropogenic CO<sub>2</sub> emissions.</p> <p>The CO<sub>2</sub> uptake of the carbon foam samples was measured at three different temperatures—273 K, 298 K, and 323 K—and at two pressures: 100 kPa and 2 MPa. The results are as follows:</p> <p>For the sample CF (carbon foam), at 273 K and 100 kPa, the CO<sub>2</sub> uptake was 5.09 ± 0.03 mmol/g, and at 2 MPa, it was 25.52 mmol/g. At 298 K, the uptake decreased to 2.90 ± 0.04 mmol/g at 100 kPa and 18.44 mmol/g at 2 MPa. At 323 K, the uptake further decreased to 1.70 ± 0.04 mmol/g at 100 kPa and 14.09 mmol/g at 2 MPa.</p> <p>The sample C<sub>3</sub>N<sub>4</sub>/CF-1 showed similar trends. At 273 K and 100 kPa, the CO<sub>2</sub> uptake was 5.24 ± 0.05 mmol/g, and at 2 MPa, it was 21.84 mmol/g. At 298 K,</p>

	<p>the uptake was <math>3.16 \pm 0.01</math> mmol/g at 100 kPa and 15.70 mmol/g at 2 MPa. At 323 K, it decreased to <math>1.97 \pm 0.02</math> mmol/g at 100 kPa and 12.04 mmol/g at 2 MPa.</p> <p>The C3N4/CF-24 sample had lower CO<sub>2</sub> uptake values. At 273 K, the uptake was <math>2.83 \pm 0.03</math> mmol/g at 100 kPa and 11.92 mmol/g at 2 MPa. At 298 K, the uptake was <math>1.57 \pm 0.04</math> mmol/g at 100 kPa and 8.19 mmol/g at 2 MPa. At 323 K, the uptake further decreased to <math>0.99 \pm 0.02</math> mmol/g at 100 kPa and 6.40 mmol/g at 2 MPa.</p> <p><a href="https://doi.org/10.1016/j.seppur.2024.129054">https://doi.org/10.1016/j.seppur.2024.129054</a></p>
5.	<p>Abstract: The utilization of in-situ heteroatom doping and carbonization techniques to produce porous biochar from waste biomass sources has the potential to significantly enhance electrochemical and CO<sub>2</sub> adsorption performance of supercapacitors. In this work, an initiative N, S-codoped biochar was prepared through carbonation and KOH-activated pyrolysis of bagasse-based polycondensate precursors, which were synthesized using sugarcane bagasse as a carbon source, 3-amino-5-methio-1,2,4-triazole as a nitrogen and sulfur source and triglycidyl isocyanurate (TGIC) as a cross-linker, for efficient CO<sub>2</sub> capture and energy storage. Through comprehensive material characterization and testing of the electrochemical and CO<sub>2</sub> adsorption performance of the N,S-codoped bagasse-based porous biochar (NSBPB), the results demonstrated that the mesoporous structure and the N, S-codoping displayed a significant synergistic effect on electrochemical and CO<sub>2</sub> adsorption properties. The optimized NSBPB-600-2 (carbonization temperature = 600°C, NSBPB-to-KOH mass ratio of 2) displayed a CO<sub>2</sub> adsorption capacity of 3.76 mmol g<sup>-1</sup>, and no significant decrease in adsorption capacity was observed over consecutive ten cycles. Moreover, the NSBPB-600-2 electrode delivered a specific capacitance of 217F g<sup>-1</sup>, and the NSBPB-600-2 symmetric supercapacitor exhibited a energy density of 13 Wh·kg<sup>-1</sup>. This approach involving in-situ heteroatom doping of porous carbon materials using clean biomass carbon sources not only offers the advantages of simplicity, environmental friendliness and low cost, but also holds great potential for applications in CO<sub>2</sub> capture and separation, as well as in supercapacitors.</p> <p>the maximum adsorption values are achieved as 3.76 mmol·g<sup>-1</sup>, 2.74 mmol·g<sup>-1</sup>, and 2.19 mmol·g<sup>-1</sup> for the NSBPB-600-2 at temperatures 298.15 K, 308.15 K and 318.15K, respectively, at 1000 mbar pressure. The. It is evident that the CO<sub>2</sub> adsorption capacity undergoes gradual decreases as the adsorption temperature increases, indicating that the CO<sub>2</sub> adsorption process on the NSBPB-600-2 sample is exothermic.</p> <p><a href="https://doi.org/10.1016/j.seppur.2024.128826">https://doi.org/10.1016/j.seppur.2024.128826</a></p>

6.	<p>Abstract:</p> <p>Cyanophyta blooms can lead to eutrophication and generate algal toxins. To reduce their environmental risks, hydrothermal carbonization was innovatively applied to simultaneously produce <b>activated carbon (AC)</b> and carbon dots (CDs). AC was further used for CO<sub>2</sub> adsorption while CDs were for preparing fluorescent materials. Yields of AC and CDs were investigated under mild conditions of 160–240 °C and 15–240 min. Characterization results show that <b>AC exhibited a large specific surface area of 990 m<sup>2</sup> g<sup>-1</sup> and pore volume of 1.14 cm<sup>3</sup> g<sup>-1</sup>, contributing to high CO<sub>2</sub> adsorption capacities of 3.26 mmol g<sup>-1</sup> (0 °C) and 2.06 mmol g<sup>-1</sup> (25 °C)</b>. Additionally, nitrogen and oxygen self-doping heteroatoms CDs, with a photoluminescence quantum yield of 2.58 %, emitted stable blue fluorescence under the ultraviolet light and were successfully applied to produce invisible ink. This work provides a paradigm for CO<sub>2</sub> reduction and high-value material synthesis via the thermochemical conversion of hazardous biomass.</p> <p>DOI: <a href="https://doi.org/10.1016/j.joei.2024.101916">https://doi.org/10.1016/j.joei.2024.101916</a></p>
7	<p>Abstract:</p> <p>To enhance CO<sub>2</sub> sorption efficiency under low-pressure conditions and effectively compete with N<sub>2</sub> sorption in flue gas, modifications are implemented aimed at improving the adsorption capacity and selectivity of ZIF-8, renowned for their robust stability. <b>Deep eutectic solvent (DES)</b> comprising tetraethylammonium chloride (TEAC), tetrapropylammonium chloride (TPAC), and tetrabutylammonium bromide (TBAB) as hydrogen-bond acceptors, along with ethanolamine (MEA) as the hydrogen-bond donor, were meticulously prepared for this purpose. ZIF-8 underwent modification through DES loading, resulting in the distinctive emergence of a “core-membrane” structure. Characterization revealed that the DES effectively adhered to the surface of <b>ZIF-8</b> in a membrane-like structure, without altering the chemical structure or pore size of ZIF-8. The most significant enhancement in sorption capacity was observed with TPAC&amp;MEA modification. Considering the presence of N<sub>2</sub> partial pressure in the flue gas, at 0.05 and 1 bar, the CO<sub>2</sub> adsorption capacities reached 1.92 and 3.03 mmol g<sup>-1</sup>, respectively, increasing 71.11 and 4.00 times compared to pristine ZIF-8. The ZIF-8 exhibited a CO<sub>2</sub>/N<sub>2</sub> separation coefficient of 72.77, which increased to a maximum of 997.50 after DES modification. Additionally, the modified material demonstrated exceptional cyclic and thermal stability during testing. This study significantly elevates the CO<sub>2</sub> adsorption capacity and selectivity of solid materials within the low-pressure range, providing pivotal support for CO<sub>2</sub> capture and decarbonization efforts.</p> <p>At <b>20 °C</b>, DES@ZIF-8 demonstrates remarkable adsorption performance, as</p>



	<p>illustrated in Fig. 5. Notably, DES-1-modified ZIF-8 exhibits the most superior performance at a DES-1 to ZIF-8 loading mass ratio of 0.5:1, showcasing an adsorption capacity of 2.35 mmol/g. This represents a significant enhancement, being 3.09 times higher than the original adsorption capacity. Both an increase and decrease in the DES loading mass ratio result in a reduction of the adsorption capacity. This observation suggests the existence of an optimal mass ratio for DES loading (33.3 wt%). Excessive DES loading obstructs the flow channels of CO<sub>2</sub>, rendering adsorption sites unusable and diminishing CO<sub>2</sub> adsorption. Conversely, insufficient DES loading leads to the wastage of positions within the framework that could construct adsorption sites, preventing the attainment of peak adsorption capacity.</p> <p>DES-2-modified ZIF-8, incorporating an HBA with three carbon chains, achieves a peak adsorption capacity of 3.03 mmol/g at the optimal loading ratio (DES-2: ZIF-8 mass ratio of 1:1). This achievement represents a notable fourfold increase compared to the original adsorption capacity. Conversely, the maximum adsorption capacity of DES-3-modified ZIF-8 experiences a reduction to 2.66 mmol/g, corresponding to a 3.50-fold increase. This reduction is observed with an increase in the carbon chain length.</p>
8	<p>Abstract:</p> <p>The preparation of hierarchical porous silica aerogels from coal gasification fine slag (CGFS) offers an effective approach to achieving high-value utilization of solid waste and reducing the production cost of solid adsorbent matrix materials. However, the main challenges involve overcoming technical barriers to efficiently and value-added conversion of CGFS into silica aerogels with CO<sub>2</sub> adsorption properties, as well as elucidating the phase transformation mechanisms during the synthesis process. In this study, CGFS was used as the raw material to obtain a silicon-containing precursor through pre-decarbonization (with ash content as high as 99.82 %) and alkali dissolution treatment. A hierarchical porous silica aerogel was then synthesized using an efficient hydrothermal process. The effect of alkali dissolution on silicon extraction and the phase transformation mechanisms were thoroughly discussed, and the leaching mechanism was analyzed through thermodynamic and kinetic models. The results showed that the high leaching rate of silicon was attributed to the presence of a large amount of amorphous SiO<sub>2</sub> in the decarbonized fine slag (DCFS), while the formation of zeolite Na-P1 and hydroxysodalite during the alkali dissolution process affected the efficiency of silicon extraction. Then, the structural formation mechanism and CO<sub>2</sub> adsorption properties of the hierarchical porous silica aerogels were analyzed using N<sub>2</sub> adsorption-desorption and CO<sub>2</sub>-TPD. The SiO<sub>2</sub>-1-30-0.5 exhibited a high CO<sub>2</sub> adsorption ability of 1.53 mmol g<sup>-1</sup>, and the CO<sub>2</sub> adsorption capacity maintained 94.78 % of the original value and after 5 adsorption-desorption cycles.</p>

	<p>Conclusions:</p> <p>his study greenly and efficiently synthesized hierarchical porous silica aerogels from CGFS through a pre-decarbonization and alkali-assisted hydrothermal treatment technique for CO<sub>2</sub> adsorption. The results showed that the synthesized silica aerogels possessed a rich micro- and mesoporous structure, with a high specific surface area of 643.48 m<sup>2</sup> g<sup>-1</sup>. The Si-O three-dimensional network structure provided numerous active sites for CO<sub>2</sub> adsorption. The three-dimensional network structure formed by Si-O bonds provided numerous basic sites for CO<sub>2</sub> adsorption. Specifically, the SiO<sub>2</sub>-1-30-0.5 demonstrated a high CO<sub>2</sub> adsorption capacity of 1.53 mmol g<sup>-1</sup> at 273 K, with its adsorption isotherm conforming to both the Langmuir and Freundlich models. After 5 adsorption-desorption cycles, the sample showed only a 5.22 % decrease in adsorption performance, demonstrating high cycle stability. This study provides an effective technical route for the high-value utilization of CGFS and the reduction of production costs for CO<sub>2</sub> solid adsorbent materials.</p> <p>DOI: <a href="https://doi.org/10.1016/j.micromeso.2024.113399">https://doi.org/10.1016/j.micromeso.2024.113399</a></p>
9	<p>Abstract:</p> <p>Activated carbon from agro-industrial waste, namely tea twigs derived from the processing of <i>Camellia Sinensis</i> branches, using a potassium hydroxide activator for CO<sub>2</sub> adsorption has been conducted in this study. Various carbonization temperatures (4000C and 5000C) and heating times of 1 h and 3 h were used in this study. The concentration of potassium hydroxide (40 % and 60 %) and the ratios of activator solutions to carbon precursor made from pyrolysis of tea twigs (2:1 and 4:1) were varied for the chemical activation process. The effectiveness results of the obtained activated carbon were characterized through using Brunauer-Emmett-Teller analyzer and Temperature Programme Desorption-CO<sub>2</sub> to determine the surface area and capacity maximum of CO<sub>2</sub> adsorption. The optimum condition for the synthesis of activated carbon that produces high surface area was obtained at sample CCS 400/1 A2B1 where biochar carbonized at temperature of 400 °C kept for 1 h with a ratio of activator solution and precursor 4:1 using KOH concentration of 40 %. The highest surface area was obtained 1403 m<sup>2</sup> g<sup>-1</sup> with pore volume 0.9 m<sup>2</sup> g<sup>-1</sup> and pore size 1.11 nm and proved the presence of microporous areas in produced activated carbon. The maximum CO<sub>2</sub> adsorption capacity obtained in this study was 5.1573 mmol g<sup>-1</sup>. This result could be related to the higher amount of microporous present in the activated carbon that facilitates the access of CO<sub>2</sub> to the active sites at the pores of activated carbon.</p> <p>Conclusion:</p> <p>Tea twigs derived from agricultural bio-waste were used to produce activated carbon in this study. The findings show that the formation of pore and surface</p>

	<p>structures is significantly influenced by the heating (carbonization) process when combined with chemical activation. A greater induction of high-heat energy is needed to produce pores on the surface of activated carbon, impacting both the surface area and the development of pores. Various carbonization temperatures (400 °C and 500 °C) and heating times (1 h and 3 h) were used in this study. The concentrations of potassium hydroxide (40 % and 60 %) and the ratios of activator solutions to the carbon precursor made from the pyrolysis of tea twigs (2:1 and 4:1) were varied for the chemical activation process. The optimum condition for synthesizing activated carbon with a high surface area was achieved with sample CCS 400/1 A2B1, where biochar was carbonized at 400 °C for 1 h with a 4:1 ratio of activator solution to carbon precursor using a KOH concentration of 40 %. The highest surface area was 1403 m<sup>2</sup> g<sup>-1</sup>, with a pore volume of 0.9 mL g<sup>-1</sup> and a pore size of 1.11 nm, demonstrating the presence of microporous areas in the produced activated carbon. The maximum CO<sub>2</sub> adsorption capacity obtained in this study was 5.1573 mmol g<sup>-1</sup>. This result can be attributed to the higher amount of micropores present in the activated carbon, which facilitates the access of carbon dioxide gas to the active sites within the pores.</p> <p>According to this study, a carbonization temperature of 400 °C is the optimal condition for carbonizing the raw material to produce activated carbon with a high specific surface area and high CO<sub>2</sub> adsorption capacity. The ratio of activator agent to carbon precursor, along with the activator concentration during chemical activation, has a significant effect on the performance of the activated carbon. The best treatment for chemical activation using KOH, based on the results of this study, was a KOH to carbon precursor ratio of 4:1 with a concentration of 40 %. Pore size was linked to the most efficient carbon dioxide adsorption, as indicated by the highest CO<sub>2</sub> adsorption values achieved for the activated carbon under each parameter condition. The activated carbon contains a higher percentage of microporous material, facilitating easier access for adsorbate to reach the active sites. The densely porous, predominantly microporous structure was also validated by the SEM images, which included network structures and three-dimensional channels.</p> <p>DOI: <a href="https://doi.org/10.1016/j.crgsc.2024.100440">https://doi.org/10.1016/j.crgsc.2024.100440</a></p>
10	<p><b>Abstract:</b></p> <p>Resin-based porous carbon materials are considered to be an important direction for CO<sub>2</sub> adsorption and supercapacitors due to their controllable chemical structure, large specific surface area, and stable physicochemical properties. But at present, the main source of resin-based porous carbon materials is petroleum-based polymer materials, which is incongruous with the tenets of green chemistry. Here, a bio-based phthalonitrile precursor containing s-triazine ring structure (TDPH) was synthesized from vanillin, then a nitrogen/oxygen co-doped hierarchical porous carbon with excellent properties, was prepared using TDPH via a two-step process, with urea/zinc chloride as hardener and potassium hydroxide as activator, respectively. The carbon material prepared under optimal conditions can achieve a maximum</p>



	<p>CO<sub>2</sub> adsorption capacity of 6.81 mmol g<sup>-1</sup> at 273 K due to its high specific surface area (1607 m<sup>2</sup> g<sup>-1</sup>) and high N/O content (7.06 wt%/14.74 wt%). It is worth noting that the CO<sub>2</sub> adsorption capacity at 298 K can still reach 96.3 % of the initial adsorption after 7 cycles. In addition, the electrochemical properties of the resultant porous carbon were tested under a 1 M H<sub>2</sub>SO<sub>4</sub> three-electrode system, and the highest specific capacitance at a current density of 0.1 A g<sup>-1</sup> was 473 F g<sup>-1</sup> and the specific capacitance retention can still reach 87 % after 65,000 cycles. This work broadens the source of resin-based porous carbon materials and paves a new way for the functionalization of bio-based resins.</p> <p>Conclusion:</p> <p>In conclusion, this paper demonstrated a novel strategy for facile synthesis of bio-based N/O co-doped hierarchical porous carbon materials by using 4-nitrophthalonitrile and a bio-based source of s-triazine triphenol monomer through a process of curing, carbonization, and activation. The objective of this study was to investigate the effect of curing temperature on the chemical structure of PN resins and the properties of porous carbon materials. The presence of a considerable number of heat-resistant aromatic N-heterocycles in the phthalonitrile resin allows for the attainment of a nitrogen content of up to 11.79 % in the prepared porous carbon. However, an excessive curing temperature results in a reduction of nitrogen content in the carbon material. This phenomenon may be attributed to the breakdown of nitrogen-containing chemical structures, such as isoindoline and phthalocyanine rings, during the resin curing process. Furthermore, the resultant hierarchical porous carbon material displayed excellent potential for CO<sub>2</sub> adsorption and energy storage, attributable to its large SSA, superior N/O atoms content, suitable pore size distribution, and abundant micropores at the same time. Particularly, the sample TDPH450/600 exhibited the ultra-high CO<sub>2</sub> adsorbing capacity of 6.81 mmol g<sup>-1</sup> at 273 K and superior specific capacitance of 473 F g<sup>-1</sup> at 0.1 A g<sup>-1</sup>, due to the TDPH450/600 possessing abundant N/O content (7.06 wt%/14.74 wt%) and superior SSA (1607 m<sup>2</sup>g<sup>-1</sup>). In addition, the porous carbon obtained exhibited excellent cyclic stability in both of the aforementioned applications, which substantiates the potential of TDPHx/600 applications. This work presents a novel approach to the straightforward fabrication of bio-based multifunctional porous carbon, which offers a promising avenue for alleviating the energy crisis.</p> <p>Doi: <a href="https://doi.org/10.1016/j.mtcomm.2024.111117">https://doi.org/10.1016/j.mtcomm.2024.111117</a></p>
11.	<p>Abstract:</p> <p>A series of porous hypercrosslinked polymers (HCP-x) were synthesized from waste polystyrene foam via Fridel-Crafts alkylation reaction, aiming to optimize the utilization of waste plastics. The impact of various crosslinkers</p>

	<p>on the structural characteristics and CO<sub>2</sub> adsorption properties of HCP-x was investigated. The results indicated that HCP-x polymers possess high specific surface areas spanning 830–1182 m<sup>2</sup> g<sup>-1</sup>, abundant narrow micropores, and exceptional thermal stability. Notably, HCP-2 exhibited the highest CO<sub>2</sub> adsorption capacity of 2.77 mmol g<sup>-1</sup> at 273 K and 1.0 bar. These hypercrosslinked polymers also demonstrated a favorable CO<sub>2</sub>/N<sub>2</sub> ideal selectivity and robust cyclic adsorption performance. Breakthrough experiments confirmed the selective adsorption of CO<sub>2</sub> from simulated flue gas containing CO<sub>2</sub>/N<sub>2</sub> (15/85). Additionally, the mechanism underlying CO<sub>2</sub> adsorption on HCP-x was elucidated by analyzing adsorption thermodynamics and diffusion kinetics. This study not only introduces an innovative method for recycling waste polystyrene foam but also underscores the potential of HCP-x as an effective adsorbent for CO<sub>2</sub> capture.</p> <p>Conclusion:</p> <p>In summary, a series of porous HCP-x materials were successfully synthesized from waste polystyrene via the Friedel-Crafts alkylation reaction, exhibiting high specific surface areas (830–1182 m<sup>2</sup> g<sup>-1</sup>) and pore volumes (0.98–1.67 cm<sup>3</sup> g<sup>-1</sup>). A systematic investigation was conducted to explore the effects of crosslinkers on the structure of HCP-x and their CO<sub>2</sub> adsorption performance. The results revealed that the pores in HCP-x are primarily narrow micropores, with a maximum CO<sub>2</sub> uptake capacity of 2.77 mmol g<sup>-1</sup> at 273 K and 1.0 bar. Notably, the adsorbent HCP-2 demonstrated exceptional cyclic adsorption performance. The adsorption enthalpy (<math>\Delta H</math>) of prepared HCP-x ranged from -19.71 to -14.09 kJ mol<sup>-1</sup>, indicating exothermic adsorption processes for CO<sub>2</sub> on HCP-x. Breakthrough experiments further underscored the significant selective separation capacity of HCP-2 for CO<sub>2</sub> in simulated mixed gas streams. Moreover, the kinetics and diffusion models analyses indicated that the HCP-x possessed fast kinetics, high adsorption capacity, and favorable intraparticle diffusion of CO<sub>2</sub> molecules, attributed to their unique porous structures. This study introduces an innovative method for repurposing discarded polystyrene foam and highlights the potential of HCP-x as an adsorbent material for CO<sub>2</sub> capture.</p> <p>DOI: <a href="https://doi.org/10.1016/j.micromeso.2024.113360">https://doi.org/10.1016/j.micromeso.2024.113360</a></p>
12.	<p>Abstract:</p> <p>The utilization of ambient low-pressure CO<sub>2</sub> adsorption for carbon neutrality initiatives holds great potential. However, conventional liquid amine absorption methods for CO<sub>2</sub> capture are plagued by high energy consumption and equipment corrosion issues. In this study, we present a novel approach using industrial waste silica fume (SF) as a precursor and tetraethylenepentamine (TEPA) as a chemical modifying agent to efficiently synthesize low-cost mesoporous solid amine adsorbents within the waste-derived mesoporous powder sorbents (MPS) series. Employing the static</p>

adsorption technique, the impact of both adsorption temperature and amine loading on the CO<sub>2</sub> adsorption efficacy was comprehensively investigated. The optimized sample, MPS-TEPA-30, demonstrated a superior CO<sub>2</sub> adsorption capacity, achieving 2.22 mmol g<sup>-1</sup> at 323 K and 1 bar, a significant 6.8-fold increase compared to the unmodified MPS material (0.326 mmol g<sup>-1</sup>). Additionally, MPS-TEPA-30 demonstrated notable performance advantages, surpassing SBA15-TEPA-30 and MCM41-TEPA-30 with near 1.49- and 2.12-fold increases in adsorption capacity, respectively. Impressively, MPS-TEPA-30 exhibited remarkable adsorption ability beyond 1.5 mmol g<sup>-1</sup> at ultralow pressures (<0.01 bar), suggesting its potential for ambient ultralow-pressure CO<sub>2</sub> capture. Moreover, MPS-TEPA-30 showed exceptional stability over multiple adsorption-desorption cycles, with only a marginal 6 % decrease in CO<sub>2</sub> capture efficiency after the seventh cycle. Thermogravimetric analysis confirmed the robust thermal stability of the amine-functionalized adsorbent (~473 K), rendering it suitable for high-temperature adsorption-desorption processes. The Ideal Adsorbed Solution Theory (IAST) equation predicted an excellent adsorption selectivity of 1600 for the CO<sub>2</sub>/N<sub>2</sub> (1:1) mixture at 323 K and 10 mbar, underscoring the promising prospects of MPS-TEPA-30 in CO<sub>2</sub> capture and selective separation applications from ambient condition.

### Conclusion:

[illegible]