



# Abu Dhabi Polytechnic

## Students' Graduation Project Abstract

<b>Department:</b>	PET	<b>Semester:</b>	Spring-2022
<b>Project Title:</b>	Removal of CO <sub>2</sub> in the production of Demineralized Water		
<b>Supervisor:</b>	Dr. Mohammad Alalaween		

### Abstract:

Carbon dioxide (CO<sub>2</sub>) in water is present as an equilibrium mixture of the dissolved gas CO<sub>2</sub>, the weak acid H<sub>2</sub>CO<sub>3</sub>, and the HCO<sub>3</sub><sup>-</sup> and CO<sub>3</sub><sup>2-</sup> anions associated with bicarbonate and carbonate alkalinity. The exact equilibrium ratio of these four species depends on the pH and temperature of the water. In a two- to four-bed ion exchange demineralization system, bicarbonate and carbonate alkalinity are converted to dissolved CO<sub>2</sub> as they pass through the cation exchange resin beds due to a reduction in pH. If CO<sub>2</sub> is not removed prior to entering the anion exchange resin beds, all CO<sub>2</sub> is converted to bicarbonate or carbonate anions as the pH increases, which exchange onto strong base anion resin. This study aimed to simulate CO<sub>2</sub> removal by installing a degasser. A CO<sub>2</sub> degasser is often used in the field of ion exchange in combination with demineralization plants. The CO<sub>2</sub> degasser is placed between the cation and anion exchangers as an integral part of the demineralization unit. This increases the capacity of the anion exchangers and prolongs their durability. By removing the CO<sub>2</sub> from the water, the ion exchange process is improved. However, due to a lack of manpower and the high budget required for degasser simulation, the project's focus shifted to CO<sub>2</sub> gas adsorption using various types of water sources, tweaking their flowrate, and measuring the PH, conductivity, and TDS. The outcome of the experiment show promising results regarding how different types of water adsorb CO<sub>2</sub> (Figures 1, 2 and 3), although further experimentation is needed, these results showcase a big step in the right direction