

THE IMPACT OF CARBONIC ACID ON POROSITY AND PORE STRUCTURE DURING MATRIX ACIDIZING OF CARBONATE RESERVOIRS: IMPLICATIONS FOR REDUCING CO₂ EMISSIONS

Abdulameer Almalichy ^{*1}, Zoltan Turzo ¹

¹ *Faculty of Earth and Environmental Sciences and Engineering, Institute of Mining and Energy,
University of Miskolc, H-3515 Miskolc-Egyetemvaros*

*Corresponding author: abdulameer.almalichy@student.uni-miskolc.hu

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This study investigates the impact of carbonic acid on pore structure and porosity during matrix acidizing in carbonate formations by analysing T₂ relaxation times and incremental porosity before and after treatment. Four core samples of Indiana limestone (outcrop formation) with dimensions of 2.5" in length and 1.5" in diameter, 14-15% porosity, and 3-7 mD permeability were used. Different injection rates (0.2, 0.5, and 1 cm³/min) were applied to assess the acid treatment's effectiveness under varying conditions. The carbonic acid was prepared by mixing 70% fresh water with 30% supercritical CO₂ at 1500 psi and room temperature. The results revealed a consistent pattern of incremental porosity and a shift in T₂ relaxation times, indicating changes in the pore structure. Specifically, the acid treatment enhanced pore connectivity and increased pore size, resulting in elevated porosity. These findings provide valuable insights into the use of CO₂ as an alternative to conventional acids for improving well productivity.