1. Introduction

- Applications of Magnetite Nanoparticles
  - Magnetite nanoparticles have received intensive interest in recent years due to their potential applications in various fields, such as in magnetic memory devices, magnetic fluids, magnetic refrigeration, magnetic resonance imaging and targeting drug delivery systems.

- Objectives of This Study
  - Synthesis of uniform magnetite nanoparticles using a high pressure homogenizer without any dispersing agent.
  - Control of the size of the magnetite nanoparticles.
  - Synthesis of superparamagnetic magnetite nanoparticles.

2. Experimental & Results

- Experimental
  0.85 M NaOH (30 ml, 0.0255 mol)
  0.1 M FeCl₂·4H₂O (100 ml, 0.01 mol)
  0.1 M FeCl₃·6H₂O
  1500 bar - 1, 3, 5 Passes

- XRD Patterns
  - The XRD pattern of the 0 pass sample showed diffraction peaks at 2θ = 21.1°, 40.3° and 53.8° from the FeOOH.
  - All the peaks of 1, 3 and 5 passes samples were matched to the inverse spinel Fe₃O₄.

3. Results & Discussion

- Average particle sizes and magnetic properties of the prepared magnetite nanoparticles

<table>
<thead>
<tr>
<th>Average Particle Size (nm)</th>
<th>Magnetic Property</th>
</tr>
</thead>
<tbody>
<tr>
<td>XRD(1)</td>
<td>TEM</td>
</tr>
<tr>
<td>FeOOH(2)(3)</td>
<td>Magnetization (emu/g)</td>
</tr>
<tr>
<td>0 Pass 26</td>
<td>-</td>
</tr>
<tr>
<td>1 Pass 21</td>
<td>20</td>
</tr>
<tr>
<td>3 Passes 19</td>
<td>17</td>
</tr>
<tr>
<td>5 Passes 23</td>
<td>22</td>
</tr>
</tbody>
</table>

4. Conclusion

- We have synthesized uniform magnetite nanoparticles using the high pressure homogenizer without dispersing agent and oxidant.
- The X-ray diffraction patterns showed that all the samples had the inverse spinel structure of magnetite nanoparticles.
- The average particle size decreased with the number of passes, but after reaching 3 passes the average particle size increased.
- The VSM measurements revealed superparamagnetism of the nanoparticles for 1 and 3 passes at 1500 bar.
- The uniform size, narrow distributions and superparamagnetism of these magnetite nanoparticles demonstrated their suitability for use as an MRI contrast agent, as magnetic fluids, and for targeting drug delivery systems.