# Role of tannin pretreatment in flotation separation of magnesite and dolomite

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**Table S1.** **Chemical composition of mineral samples** wt%

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Sample | MgO | CaO | SiO2 | TFe | Purity |
| Magnesite | 47.12 | 0.14 | 0.16 | <0.10 | 98.56 |
| Dolomite | 20.95 | 29.92 | 0.11 | 0.12 | 98.42 |

**Table S2.** **Flotation separation results of the mixed mineral samples**

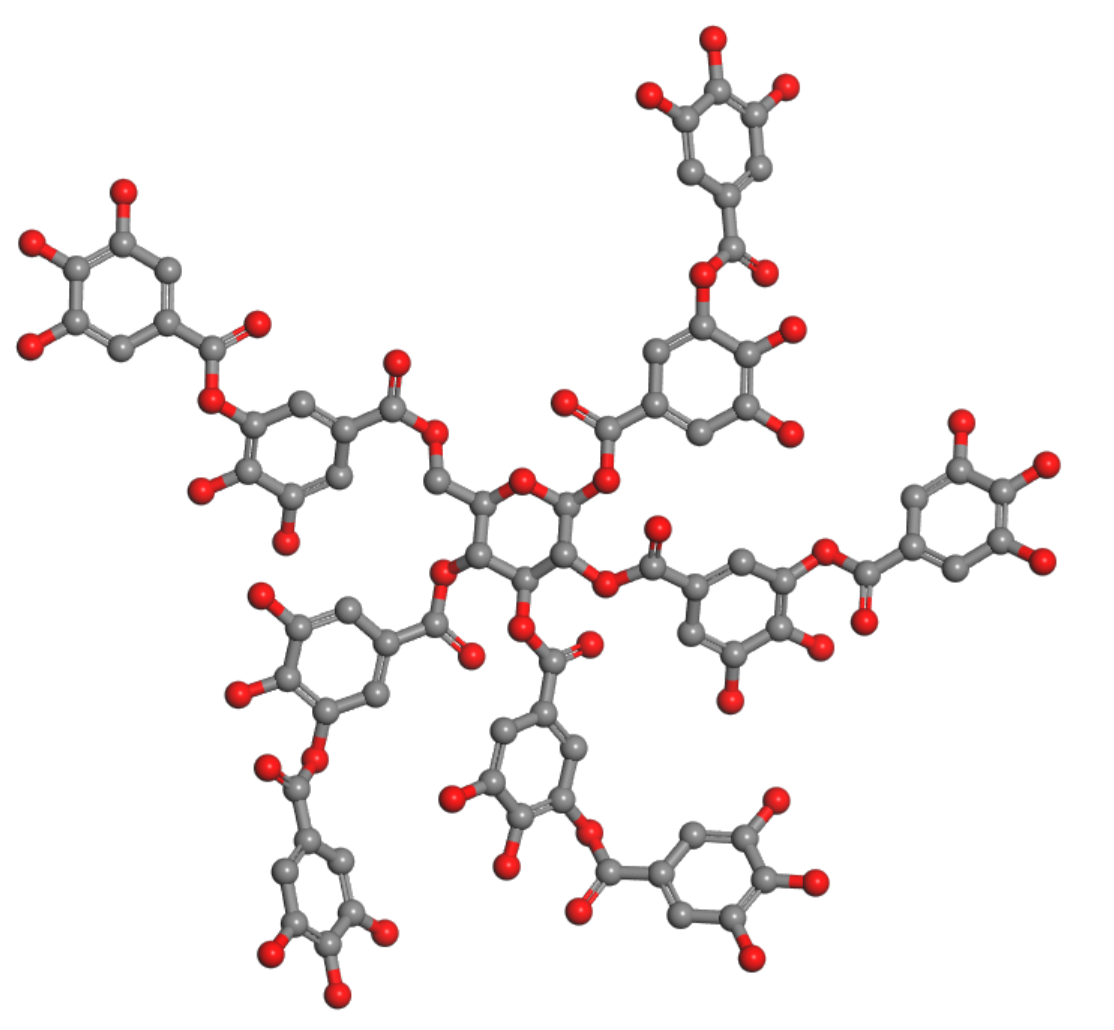
|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Reagents | Products | Yields (%) | Grade (%) | | | Recovery (%) | | SI |
| MgO | CaO | Magnesite | | Dolomite |
| NaOl: 110 mg·L−1 | Concentrate | 87.56 | 42.18 | 5.78 | 88.77 | | 82.72 | 1.65 |
| Tailing | 12.44 | 39.85 | 8.31 | 11.23 | | 17.28 |
| Feed | 100.00 | 41.89 | 6.10 | 100.00 | | 100.00 |
| Tannin pretreatment  NaOl:110 mg·L−1 | Concentrate | 75.65 | 44.76 | 2.84 | 86.05 | | 34.04 | 3.46 |
| Tailing | 24.35 | 32.94 | 16.21 | 13.95 | | 65.96 |
| Feed | 100.00 | 41.89 | 6.10 | 100.00 | | 100.00 |

**Table S3. Surface element composition of magnesite and dolomite before and after tannin pretreatment**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Sample | Element (atomic %) | | | |
| C 1s | O 1s | Mg 1s | Ca 2p |
| Magnesite | 43.59 | 51.80 | 4.61 |  |
| Tannin-pretreated magnesite | 44.66 | 50.88 | 4.46 |  |
| Offset | 1.07 | −0.92 | −0.15 |  |
| Dolomite | 43.49 | 43.90 | 3.74 | 8.87 |
| Tannin-pretreated dolomite | 45.95 | 42.15 | 3.63 | 8.27 |
| Offset | 2.46 | −1.75 | −0.11 | −0.60 |

**Table S4. Interaction energies of the magnesite and dolomite surfaces with tannin**

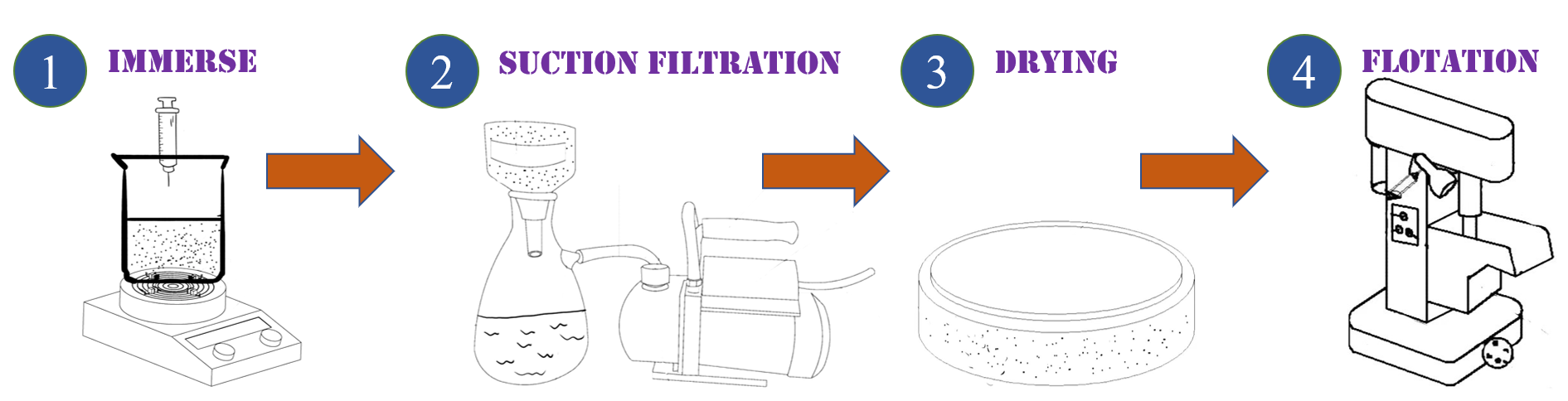
|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Reaction conditions | *Etotal* (eV) | *Emole* (eV) | *Ecrystal* (eV) | *Eads* (eV) |
| Dolomite (104) + tannin | −339.45396 | −78.652617 | −213.22243 | −5.218543 |
| Magnesite (104) + tannin | −292.69208 | −78.652617 | −255.5828 | −0.817033 |

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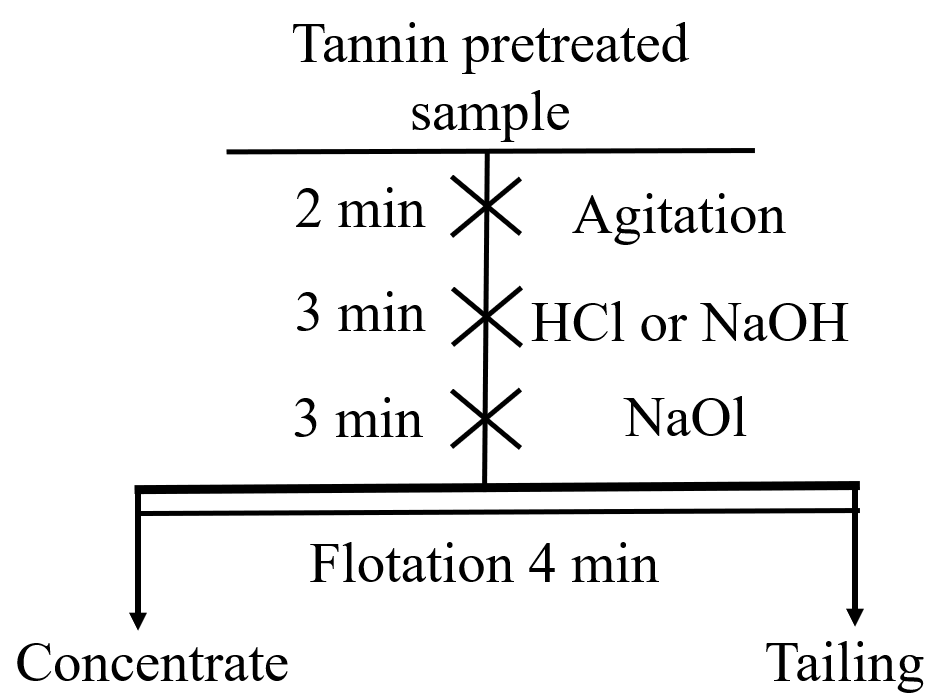
**Fig. S1. Structure of the tannic acid.**



**Fig. S2. X-ray powder diffraction patterns of the magnesite (a) and dolomite (b) samples.**



**Fig. S3. Tannin pretreatment process.**



**Fig. S4. Flow chart of microflotation test.**



**Fig. S5. Effect of tannin-pretreated concentrations on the floatabilities of magnesite and dolomite.**



**Fig. S6. Effect of pretreatment time of tannin on the floatabilities of magnesite and dolomite.**