Elastic scattering and breakup reactions of the mirror nuclei ^{12}B and ^{12}N on ^{208}Pb using *ab initio* structure inputs

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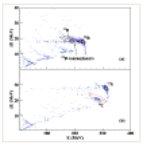
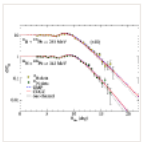
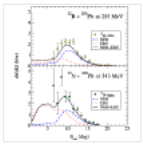
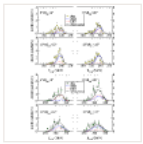
ABSTRACT

The angular distributions for the elastic scattering and breakup reactions of the mirror nuclei ^{12}B and ^{12}N on a ^{208}Pb target, at incident energies of 255 MeV and 343 MeV, respectively, were measured at HIRFL-RIBLL. The elastic scattering and breakup angular distributions of the halolike nucleus ^{12}N ($S_p = 0.601$ MeV) have been measured simultaneously. Elastic scattering cross sections were accurately reproduced by continuum discretized coupled channel calculations, which did not exhibit any significant Coulomb rainbow suppression. We have analyzed the energy and angular distributions of inclusive ^{11}B and ^{11}C fragments, produced by direct reaction processes, taking into account the contributions from both elastic breakup (EBU) and nonelastic breakup (NEB). Since the breakup data is inclusive with respect to the final state of the core nucleus, the contribution of each of these core states was calculated separately and then the corresponding cross sections added together using as weights the spectroscopic factors for each configuration computed with the *ab initio* no-core shell model. The results were found to be mostly consistent with the experimental data and, furthermore, demonstrate that EBU is highly dependent on the binding energy, while the results of NEB show no clear effect.

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Physics Subject Headings (PhySH)

Research Areas

Breakup reactions (/search/results?clauses=%5B%7B%22field%22%3A%22physh%22%2C%22value%22%3A%22%7B%5C%22facetid%5C%22%3Anull%2C%5C%22conceptid%5C%22%3A%
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Heavy-ion reaction mechanisms (/search/results?clauses=%5B%7B%22field%22%3A%22physh%22%2C%22value%22%3A%22%7B%5C%22facetid%5C%22%3Anull%2C%5C%22conceptid%5C%22%3A%5C%227cd84fc1-1dfc-4868-8269-40f1c7d73fb2%5C%22%2C%5C%22label%5C%22%3A%5C%22Heavy-ion%20reaction%20mechanisms%5C%22%2C%5C%22facetlabel%5C%22%3A%5C%22%5C%22%7D%22%2C%22operator%22%3A%22AND%22%7D%5D&per_page=20)

Unstable nuclei induced nuclear reactions (/search/results?clauses=%5B%7B%22field%22%3A%22physh%22%2C%22value%22%3A%22%7B%5C%22facetid%5C%22%3Anull%2C%5C%22c
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Properties

6 ≤ A ≤ 19 (/search/results?clauses=%5B%7B%22field%22%3A%22physh%22%2C%22value%22%3A%22%7B%5C%22facetid%5C%22%3Anull%2C%5C%22conceptid%5C%22%3A%5C%22
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Techniques

Ab initio calculations (/search/results?clauses=%5B%7B%22field%22%3A%22physh%22%2C%22value%22%3A%22%7B%5C%22facetid%5C%22%3Anull%2C%5C%22conceptid%5C%22%3
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Optical, coupled-channel & distorted wave models (/search/results?clauses=%5B%7B%22field%22%3A%22physh%22%2C%22value%22%3A%22%7B%5C%22facetid%5C%22%3Anull%2C%5C%22conceptid%5C%22%3A%5C%220593c217-5a51-4a64-bac7-e9f379367df6%5C%22%2C%5C%22label%5C%22%3A%5C%22Optical%2C%20coupled-channel%20%26%20distorted%20wave%20models%5C%22%2C%5C%22facetlabel%5C%22%3A%5C%22%5C%22%7D%22%2C%22operator%22%3A%22AND%22%7D%5D&per_page=20

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Shell model (/search/results?clauses=%5B%7B%22field%22%3A%22physh%22%2C%22value%22%3A%22%7B%5C%22facetid%5C%22%3Anull%2C%5C%22conceptid%5C%22%3A%5C%
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Nuclear Physics

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