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Intensification of boron isotopes separation by the laser field manipulation within the method of isotopes separation by selective condensation retardation in overcooled gas flow

Konstantin Lyakhov, Alexander Pechen and **Heon-Ju Lee**
Jeju National University, South Korea

Laser pulse shape manipulation can serve as an efficient tool for selective quantum level population control. In this paper it will be demonstrated parametrization of laser pulse shape, parameters variation of which can be implemented by an optical mask applied to the seed pulse. Its further amplification is provided by subsequent cell filled by CO_2 laser medium, the output laser pulse is subject to use in the method of isotopes separation by selective retardation of condensation in overcooled gas flow(SILARC), for selective excitation of all four chlorine isotopologues of $11BCl_3$ with small time delays, corresponding to respective levels population build up times. It is acheieved by that laser pulse emission spectrum has modes matching absorption lines of different chlorine isotopologues in $11BCl_3$. In order to provide the largest interaction volume of gas flow with laser beam, the latter should intersect it as many times as possible and ambient gas pressure should be maintained on the level, such that gas flow remains planar over all its extension from the nozzle outlet to the skimmer inlet. In order to save expensive laser photons, we assume, that reflectivity of mirror walls is very high and resonator condition inside irradiation cell is fulfilled. Comparison of our results for enrichment factor and product cut time evolution with one mode continuous excitation indicates that pulsed irradiation with specifically designed laser pulse shape allows to increase extractable per cycle isotope quantity significantly at the same energy expenses. Calculations were carried out at the temperature and initial laser intensity, corresponding to the maximum of isotope production over gas flow transition time across irradiation cell. Gas flow static pressure and BCl_3 molar fraction in carrier gas-argon are chosen to fixed at some small values minimize isotope scrambling.

Biography

Konsantin Lyakhov has completed his PhD from Frankfurt University. He is working as a Research Professor in Nuclear and Energy Engineering Department of Jeju National University. He has published 12 papers in SCOPUS indexed journals.

lyakhov2000@yahoo.com

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