

AU IdBarkach, T Chabot, M Beroff, K Della Negra, S Lesrel, J Geslin, F Le Padellec, A Mahajan, T Diaz-Tendero, S

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TI Breakdown curves of CH₂(+), CH₃(+), and CH₄(+) molecules

SO ASTRONOMY & ASTROPHYSICS

LA English

DT Article

DE astrochemistry; ISM: molecules; molecular processes

ID ELECTRON-IMPACT IONIZATION; POTENTIAL-ENERGY SURFACES; DISSOCIATIVE RECOMBINATION; CROSS-SECTIONS; BRANCHING RATIOS; AB-INITIO; METHANE; INTERSTELLAR; STATES; IONS

AB Aims. The aim of this work is to furnish branching ratios (BRs) to the kinetic databases used in astrochemistry such as the KINetic Database for Astrochemistry (KIDA). This concerns CH_y(+) species (y = 2-4) excited by cosmic rays, electrons and photons, or the intermediate excited complexes CH_y(+) resulting from a chemical reaction. Methods. The full set of fragmentation branching ratios following CH_y+ (y = 2,4) of constant velocity (250 keV u⁻¹) colliding with He atoms has been measured with the multidetector AGAT. Kinetic energy distributions of neutral fragments produced in each dissociation channel have been also measured. With these experimental inputs, and theoretical dissociation energies, semiempirical breakdown curves (BDCs) have been constructed. Results. Prediction of BRs with the present BDCs is found to agree with available BR measurements for electronic dissociative recombination, collision with fast electron and photodissociation. Dependence of BRs with the various UV fields relevant to interstellar medium and planetary atmospheres is predicted.

C1 [IdBarkach, T.; Chabot, M.; Della Negra, S.; Lesrel, J.; Geslin, F.] Univ Paris Sud, Univ Paris Saclay, CNRS, IPNO, F-91406 Orsay, France. [Beroff, K.; Mahajan, T.] Univ Paris Sud, Univ Paris Saclay, CNRS, ISMO, F-91405 Orsay, France. [Le Padellec, A.] Univ Toulouse, IRAP, UPS OMP, F-31028 Toulouse 4, France. [Diaz-Tendero, S.] Univ Autonoma Madrid, Dept Quim, Condensed Matter Phys Ctr IFIMAC, Inst Adv Res Chem Sci IAdChem, Modulo 13, E-28049 Madrid, Spain.

RP Chabot, M (reprint author), Univ Paris Sud, Univ Paris Saclay, CNRS, IPNO, F-91406 Orsay, France.

EM chabot@ipno.in2p3.fr

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PI LES ULIS CEDEX A
PA 17, AVE DU HOGGAR, PA COURTABOEUF, BP 112, F-91944 LES ULIS CEDEX A,
FRANCE
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