物質科学セミナー

TIMS, CiRfSE共催

日時：11月24日14時30分 から1時間程度
場所：3B213プレゼンルーム
タイトル：Eley-Rideal reactions of hot atoms and molecules at surfaces
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概要：Most chemical reactions proceed along the Langmuir-Hinshelwood (LH) route: reactants adsorb at a surface and possibly dissociate, the adsorbates diffuse over the surface, find reaction partners, and form a product molecule that subsequently desorbs. Because making and breaking of bonds is more facile at surfaces than in the gas or liquid phase, heterogeneous catalysis is applied a lot in (bulk) chemistry. It decreases activation barriers and steers the reaction in the desired direction.
The mechanism of incident radicals, for which no chemical bond needs to be broken, can proceed in a different way. Often these reactions are exothermic and can act promptly. That the mechanism is different was already recognized by Eley and Rideal (ER) around 1940.
Such reactions are rare and recently have been studied extensively for hydrogen atoms. For non-hydrogenic, ‘heavy’ atoms they were considered unlikely. Recently at the FOM Institute DIFFER we have identified such reactions for hyperthermal nitrogen atoms reacting with adsorbed O or N atoms on Ag and Ru. The reaction cross sections are surprisingly large, an up to now not fully understood effect. The mechanism of such ER reactions will be discussed in this presentation.
One way of turning (LH) reactions into ER reactions could be by specific excitation of the internal degrees of freedom of molecules. Vibrational excitation of CH_4 leads to much larger dissociative sticking coefficients. We have started a project to increase the reactivity of CO_2 by plasma activation. Both in the gas phase and for reactions at a catalyst distinct effects of the plasma activation can be observed. In this presentations first results of plasma catalysis of CO_2 will be shown.

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