Contribution ID: **68** Type: **not specified**

Advances in microscopic modeling of (n,xnγ) reactions for actinides

Tuesday 12 June 2018 15:15 (30 minutes)

Recent developments in nuclear structure approaches offer a great mean to improve various aspects of nuclear reaction modeling and to further understand reaction mechanisms from a microscopic point of view. Recently, direct and pre-compound nucleon emission, for nucleon induced reaction on spherical and axially deformed nuclei, have been successfully modeled [1] using a description of target states provided by fully consistent axially-symmetric deformed quasi-particle random-phase approximation (QRPA) calculations [2]. Direct inelastic scattering to target excitations built from one-phonon QRPA states accounted simultaneously for direct inelastic scattering to discrete states, and pre-equilibrium emission as far as second order processes, that involve more complex excitations such as two-phonon states, and multiple emission remain negligible. The QRPA nuclear structure approach has also been applied recently to determine, for a large pannel of even-even nuclei, E1 and M1 photon strength functions [3], that play a key-role in the modeling of statistical reactions.\\

We will first review the status on the ongoing work on direct/pre-compound neutron emission for neutron induced reaction below 20˜MeV for even-even actinides.
Target states are described as rotational bands built from each state in the target intrinsic frame, described as QRPA one-phonon excitation of the intrinsic correlated ground state. QRPA excitations which display a collective character can thus be viewed as vibrational band heads. Couplings between states of the GS band and states belonging to an excited band are accounted for within a coupled channel framework. Relative strengths of these couplings, for various neutron incident energies, transfer angular momenta, and intrinsic states properties, are analyzed in order to define the relevent coupled channel scheme that is needed in the determination of direct/pre-compound cross-sections.\\

Our approach in then applied to the modeling of (n,n'γ) reactions for various even-even actinides and for both intra- and inter-band gamma transitions [4]. For these reactions, the role played by the present microscopic approach for direct/pre-equilibrium emission is discussed. Thus, we finally focus on the impact on the determination of (n,n'γ) cross sections of newly calculated QRPA E1- and M1-photon strength functions, that enter the description of statistical decay from compound nucleus states in the continuum.\\[1cm]

{\footnotesize
\noindent
[1] M. Dupuis, E. Bauge, S. Hilaire, F. Lechaftois, S. P\'eru, N. Pillet and C. Robin, Eur. Phys. J. A, 51 12 (2015) 168.\\[.1cm]
[2] S. P\'eru,G. Gosselin, M. Martini, M. Dupuis, S. Hilaire, and J.-C. Devaux, Phys. Rev. C 014314 (2011).\\[.1cm]
[3] S. Goriely, S. Hilaire, S. P\'eru, M. Martini, I. Deloncle, and F. Lechaftois
Phys. Rev. C 94, 044306 (2016); M. Martini, S. P\'eru, S. Hilaire, S. Goriely, and F. Lechaftois, Phys. Rev. C 94, 014304 (2016).\\[.1cm]
[4] M. Dupuis, S. Hilaire, S. P\'eru, E. Bauge, M. Kerveno, P. Dessagne and G. Henning EPJ Web Conf., 146 (2017) 12002.}

Author: Dr DUPUIS, Marc (CEA, DAM, DIF)

Co-authors: Dr HILAIRE, Stéphane (CEA, DAM, DIF); Dr PÉRU, Sophie (CEA, DAM, DIF); Dr KERVENO, Maélle (IPHC, Strasbourg); Prof. DESSAGNE, Philippe (IPHC, Strasbourg); Dr GREGOIRE, Henning (IPHC, Strasbourg)

Presenter: Dr DUPUIS, Marc (CEA, DAM, DIF)

Session Classification: Nuclear reactions

Track Classification: Nuclear reactions