ATOMIC SPECTROSCOPY: ASTRONOMY TO BIO-MEDICAL SCIENCE

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Spectroscopy is the main step to understanding the details of the universe. Under the Iron Project (IP), an international collaboration of countries US, UK, France, Germany, Belgium, and Venezuela, we have been carrying out systematic study of radiative and collisional atomic processes, including atomic spectroscopy, of iron-peak elements abundant in astronomical objects. We have developed the method, relativistic Breit-Pauli R-matrix in close coupling approximation, to calculate large number of fine structure energy levels and transitions among them and procedure to identify the levels spectroscopically by employing quantum defect analysis, interacting channel contributions, LS- and JJ-coupling algebra. I will discuss these with astrophysical applications. One important aspect, highly relevant to Pitzer symposium, will be X-ray spectroscopy of heavy elements and its application especially to biomedical science under our interdisciplinary program that Russ Pitzer has been involved for about 4 years. Heavy elements produce hard X-rays with with large attenuation coefficients and can be implemented in cancer theranostics. [a] [b]

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[b] "Resonant X-ray Irradiation of High-Z Nanoparticles For Cancer Theranostics", Anil Pradhan, Sultana Nahar, Max Montenegro, Chiranjib Sur, Mike Mrozik, Russ Pitzer, Yan Yu, Eric Silver, *Ohio Nanotechnology Summit 2007*, April 24-25, Akron, Ohio, Poster Sessions and Abstracts, NB-3, p.37