Abstract Submitted to the
3rd Conference on Concepts in Electron Correlation
30 September - 5 October, 2005
Hvar, Croatia

Strongly correlated superconductivity: hints from the Kondo physics

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There exist pairing mechanisms robust against strong correlations. The spin-exchange in the t-J model is an example; it induces an intersite pairing which is not affected by an on-site repulsion. Another example is offered by the Jahn-Teller (JT) coupling which seems to be the main pairing mechanism in fullerenes. The J-T effect has indeed the nice feature of splitting multiplets at fixed charge without moving appreciably their center of gravity, thus not competing against strong correlations.

We study the interplay between J-T coupling and strong correlations in a single impurity model for C_{60}^{n-} by means of NRG and Conformal Field Theory as well as in a model for alkali doped fullerenes by DMFT. We show that the single impurity behavior are extremely useful to interpret the DMFT calculations.

The outcome of our analysis is that the J-T pairing mechanism is not only robust against strong-correlations but it actually hugely enhanced by it, especially nearby the Mott transition. Furthermore we show evidences that the normal phase of the superconducting region near the Mott transition is not a conventional Fermi liquid and might even develop a pseudo-gap. Although these results are obtained for a specific model, the physical scenario underlying this behavior seems to be quite general.

Refs.: M. Capone, M. Fabrizio, C. Castellani and E. Tosatti, Science **296**, 2364 (2002); Phys. Rev. Lett. **93**, 047001 (2004); L. De Leo and M. Fabrizio, *ibid.* **94**, 236401 (2005).

Keywords : Mott transition, Superconductivity, Anderson impurity models