When are two C*-algebras Jordan isomorphic?

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From its very beginnings the theory of C^*-algebras has been closed related to Quantum Mechanics, since the observables in a quantum mechanical system can be described by self-adjoint operators on Hilbert space. However, as was observed by Jordan, von Neumann and Wigner, the Jordan algebra structure of a C^*-algebra is even more closely tied to the physical situation. Thus, from the point of view of Physics at least, a natural question is when two C^*-algebras are isomorphic as Jordan algebras. (Under special circumstances this may then even imply that they are isomorphic as C^*-algebras.)

One the best known and most important results is Kadison's theorem stating that a unital surjective isometry between C^*-algebras must be a Jordan $*$-algebra isomorphism. We study the question whether there is an analogous chracterisation of non-selfadjoint Jordan algebra isomorphisms. Maybe not surprising this leads us to spectral theory in C^*-algebras and mappings preserving the spectral radius.