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Extreme Chemical Disorder and the Electrical Transport Properties of Concentrated Solid Solution Alloys: From Binaries to High Entropy Alloys Replace this text with your abstract title G. MALCOLM STOCKS, GERMAN SAMOLYUK, SUFFIAN KHAN, Materials Science Technology Division, Oak Ridge National Laboratory, Oak Ridge, TN 37830, USA, MARKUS DAENE, Physical and Life Sciences, Lawrence Livermoore Natioanl Laboratory, Livermore CA 94551, USA, SEBASTIAN WIMMER, Department Chemie, Ludwig-Maximilians-Universitt Mnchen, 81377 Mnchen, Germany, BRIAN SALES, HONGBIN BEI, KE JIN, Materials Science Technology Division, Oak Ridge National Laboratory, Oak Ridge, TN 37830, USA — We present the results of experimental and theoretical studies of electrical transport properties of a family of 2, 3, 4 and 5-component concentrated solid solution alloys (CSA) comprising subsets of the *3d*- and *4d*-transition metal elements Cr, Mn, Fe, Co, Ni and Pd. Many of this family of CSA show unusual mechanical, magnetic and transport properties as well as indications of increased radiation resistance that are clearly related to the underlying chemical disorder. Here we show the results of calculations of the electrical transport properties that are based on the *ab initio* Korringa-Kohn-Rostoker coherent-potential-approximation (KKR-CPA) method for treating the effect of substitutional disorder, and necessary configurational averaging, on the underlying electronic structure. We compare calculated residual (T=0K) resistivities to corresponding experimental measurements and relate the variations in residual resistivity, which span almost two orders of magnitude, to the underlying electron structure.

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