Relativity-Induced Ordering and Phase Separation in Intermetallic Compounds

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Relativity-Induced Ordering and Phase Separation in Intermetallic Compounds.

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(received 31 August 1992; accepted in final form 29 October 1992)

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| Ni _{0.5} Pt _{0.5} | | Rendom | <i>I</i> 1 | Random |
| $\frac{\text{Ni}_{0.5}\text{Pt}_{0.5}}{\Delta E_{\text{VD}}}$ | + 543.6 | Rendom + 543.6 | + 426.8 | + 426.8 |
| $\frac{\text{Ni}_{0.5}\text{Pt}_{0.5}}{\Delta E_{\text{VD}}}$ | + 543.6 - 398.4 | Fendom + 543.6 - 307.0 | + 426.8 - 504.5 | Random + 426.8 - 403.3 |
| $\frac{\text{Ni}_{0.5} \text{Pt}_{0.5}}{\Delta E_{\text{VD}}}$ ΔE_{CE} ΔE_{REL} | + 543.6 - 398.4 - 51.6 | Rendom + 543.6 - 307.0 - 60.5 | <i>I</i> 1 + 426.8 - 504.5 - 18.0 | Random + 426.8 - 403.3 - 53.8 |
| $\frac{\frac{\text{Ni}_{0.5} \text{Pt}_{0.5}}{\Delta E_{\text{VD}}}}{\Delta E_{\text{CE}}}{\Delta E_{\text{REL}}}{\Delta H}$ | + 543.6 - 398.4 - 51.6 + 93.6 | Rendom + 543.6 - 307.0 - 60.5 + 176.1 | <i>I</i> 1 + 426.8 - 504.5 - 18.0 - 95.7 | Random + 426.8 - 403.3 - 53.8 - 30.3 |
| $\frac{\frac{Ni_{0.5}Pt_{0.5}}{\Delta E_{VD}}}{\Delta E_{CE}}$ | | Rendom + 543.6 - 307.0 - 60.5 + 176.1 - | <i>I</i> 1 + 426.8 - 504.5 - 18.0 - 95.7 - 65.4 | Handom + 426.8 - 403.3 - 53.8 - 30.3 |
| $\frac{Ni_{0.5}Pt_{0.5}}{\Delta E_{VD}}$ $\frac{\Delta E_{CE}}{\Delta E_{REL}}$ ΔH $\frac{\delta E_{ord}}{\Delta W}$ | | Rendom + 543.6 - 307.0 - 60.5 + 176.1 | <i>I</i> 1 + 426.8 - 504.5 - 18.0 - 95.7 - 65.4 | Handom + 426.8 - 403.3 - 53.8 - 30.3 |
| $\frac{\text{Ni}_{0.5} \text{Pt}_{0.5}}{\Delta E_{\text{VD}}}$ $\frac{\Delta E_{\text{CE}}}{\Delta E_{\text{REL}}}$ $\frac{\Delta H}{\delta E_{\text{ord}}}$ $Au_{0.5} \text{Pt}_{0.5}$ | | Rendom + 543.6 - 307.0 - 60.5 + 176.1 - | T 1 + 426.8 - 504.5 - 18.0 - 95.7 - 65.4 | Handom + 426.8 - 403.3 - 53.8 - 30.3 |
| $\frac{\text{Ni}_{0.5} \text{Pt}_{0.5}}{\Delta E_{\text{VD}}}$ $\frac{\Delta E_{\text{CE}}}{\Delta E_{\text{REL}}}$ $\frac{\Delta H}{\delta E_{\text{ord}}}$ $\frac{\text{Au}_{0.5} \text{Pt}_{0.5}}{\Delta E_{\text{VD}}}$ | $ \begin{array}{r} $ | Pendom + 543.6 - 307.0 - 60.5 + 176.1 + 42.3 | <i>I</i> 1 + 426.8 - 504.5 - 18.0 - 95.7 - 65.4 + 48.6 | Bandom + 426.8 - 403.3 - 53.8 - 30.3 - + 48.6 |
| $\frac{\text{Ni}_{0.5} \text{Pt}_{0.5}}{\Delta E_{\text{VD}}}$ $\frac{\Delta E_{\text{VD}}}{\Delta E_{\text{CE}}}$ ΔE_{REL} ΔH $\frac{\delta E_{\text{ord}}}{Au_{0.5} \text{Pt}_{0.5}}$ $\frac{\Delta E_{\text{VD}}}{\Delta E_{\text{CE}}}$ | $ \begin{array}{r} $ | Pendom + 543.6 - 307.0 - 60.5 + 176.1 + 42.3 - 103.5 | $ \begin{array}{r} I \\ + 426.8 \\ - 504.5 \\ - 18.0 \\ - 95.7 \\ - 65.4 \\ + 48.6 \\ + 28.2 \\ \end{array} $ | Bandom + 426.8 - 403.3 - 53.8 - 30.3 - + 48.6 + 1.5 |
| $\frac{Ni_{0.5}Pt_{0.5}}{\Delta E_{VD}}$ $\frac{\Delta E_{CE}}{\Delta E_{REL}}$ ΔH $\frac{\delta E_{ord}}{\Delta u_{0.5}Pt_{0.5}}$ $\frac{\Delta E_{VD}}{\Delta E_{CE}}$ $\frac{\Delta E_{OD}}{\Delta E_{CE}}$ | $ \begin{array}{r} 7 1 \\ + 543.6 \\ - 398.4 \\ - 51.6 \\ + 93.6 \\ - 82.5 \\ + 42.3 \\ - 113.5 \\ ~ 0 \end{array} $ | Rendom + 543.6 - 307.0 - 60.5 + 176.1 + 42.3 - 103.5 ~ 0 | $ \begin{array}{r} I \\ + 426.8 \\ - 504.5 \\ - 18.0 \\ - 95.7 \\ - 65.4 \\ + 48.6 \\ + 28.2 \\ ~ 0 \end{array} $ | Bandom + 426.8 - 403.3 - 53.8 - 30.3 - + 48.6 + 1.5 ~ 0 |
| $\frac{Ni_{0.5}Pt_{0.5}}{\Delta E_{VD}}$ $\frac{\Delta E_{CE}}{\Delta E_{REL}}$ ΔH $\frac{\delta E_{ord}}{\Delta u_{0.5}Pt_{0.5}}$ $\frac{\Delta E_{VD}}{\Delta E_{CE}}$ $\frac{\Delta E_{REL}}{\Delta H}$ | $ \begin{array}{r} $ | Rendom + 543.6 - 307.0 - 60.5 + 176.1 - + 42.3 - 103.5 ~ 0 - 61.2 | $ \begin{array}{r} I \\ + 426.8 \\ - 504.5 \\ - 18.0 \\ - 95.7 \\ - 65.4 \\ + 48.6 \\ + 28.2 \\ ~ 0 \\ + 76.8 \\ $ | Bandom + 426.8 - 403.3 - 53.8 - 30.3 - + 48.6 + 1.5 ~ 0 + 50.1 |
| $ \frac{Ni_{0.5}Pt_{0.5}}{\Delta E_{VD}} $ $ \frac{\Delta E_{CE}}{\Delta E_{REL}} $ $ \Delta H $ $ \frac{\delta E_{ord}}{\Delta U_{0.5}Pt_{0.5}} $ $ \frac{\Delta E_{VD}}{\Delta E_{CE}} $ $ \frac{\Delta E_{REL}}{\Delta H} $ $ \frac{\delta E_{ord}}{\delta E_{REL}} $ | $ \begin{array}{r} 71 \\ + 543.6 \\ - 398.4 \\ - 51.6 \\ + 93.6 \\ - 82.5 \\ + 42.3 \\ - 113.5 \\ ~ 0 \\ - 71.2 \\ - 10.0 \\ - 10.0 $ | Rendem + 543.6 - 307.0 - 60.5 + 176.1 + 42.3 - 103.5 ~ 0 - 61.2 | $ \begin{array}{r} I \\ + 426.8 \\ - 504.5 \\ - 18.0 \\ - 95.7 \\ - 65.4 \\ + 48.6 \\ + 28.2 \\ ~ 0 \\ + 76.8 \\ + 26.7 \\ $ | Bandom + 426.8 - 403.3 - 53.8 - 30.3 + 48.6 + 1.5 ~ 0 + 50.1 |
| $\frac{Ni_{0.5}Pt_{0.5}}{\Delta E_{VD}}$ $\frac{\Delta E_{CE}}{\Delta E_{REL}}$ ΔH $\frac{\delta E_{ord}}{\Delta u_{0.5}Pt_{0.5}}$ $\frac{\Delta E_{VD}}{\Delta E_{CE}}$ $\frac{\Delta E_{REL}}{\Delta H}$ $\frac{\Delta H}{\delta E_{ord}}$ | $ \begin{array}{r} $ | Rendem + 543.6 - 307.0 - 60.5 + 176.1 - + 42.3 - 103.5 ~ 0 - 61.2 - | $ \begin{array}{r} I \\ + 426.8 \\ - 504.5 \\ - 18.0 \\ - 95.7 \\ - 65.4 \\ + 48.6 \\ + 28.2 \\ ~ 0 \\ + 76.8 \\ + 26.7 \\ \end{array} $ | Bandom + 426.8 - 403.3 - 53.8 - 30.3 + 48.6 + 1.5 ~ 0 + 50.1 |
| $\frac{Ni_{0.5}Pt_{0.5}}{\Delta E_{VD}}$ $\frac{\Delta E_{CE}}{\Delta E_{REL}}$ ΔH $\frac{\delta E_{ord}}{\Delta u_{0.5}Pt_{0.5}}$ $\frac{\Delta E_{VD}}{\Delta E_{CE}}$ $\frac{\Delta E_{REL}}{\Delta H}$ $\frac{\delta E_{ord}}{\delta E_{ord}}$ $Ni_{0.5}Au_{0.5}$ | $ \begin{array}{r} $ | Rendem + 543.6 - 307.0 - 60.5 + 176.1 - + 42.3 - 103.5 ~ 0 - 61.2 | $ \begin{array}{r} I \\ + 426.8 \\ - 504.5 \\ - 18.0 \\ - 95.7 \\ - 65.4 \\ + 48.6 \\ + 28.2 \\ ~ 0 \\ + 76.8 \\ + 26.7 \\ \end{array} $ | Bandom + 426.8 - 403.3 - 53.8 - 30.3 + 48.6 + 1.5 ~ 0 + 50.1 |
| $\frac{Ni_{0.5}Pt_{0.5}}{\Delta E_{VD}}$ $\frac{\Delta E_{CE}}{\Delta E_{REL}}$ $\frac{\Delta H}{\delta E_{ord}}$ $\frac{Au_{0.5}Pt_{0.5}}{\Delta E_{VD}}$ $\frac{\Delta E_{VD}}{\Delta E_{CE}}$ $\frac{\Delta E_{REL}}{\Delta H}$ $\frac{\delta E_{ord}}{Ni_{0.5}Au_{0.5}}$ | $ \begin{array}{r} $ | Rendem + 543.6 - 307.0 - 60.5 + 176.1 - + 42.3 - 103.5 ~ 0 - 61.2 | $ \begin{array}{r} 1 \\ + 426.8 \\ - 504.5 \\ - 18.0 \\ - 95.7 \\ - 65.4 \\ \end{array} $ $ \begin{array}{r} + 48.6 \\ + 28.2 \\ \sim 0 \\ + 76.8 \\ + 26.7 \\ \end{array} $ | Random + 426.8 - 403.3 - 53.8 - 30.3 - + 48.6 + 1.5 ~ 0 + 50.1 |
| $\frac{Ni_{0.5} Pt_{0.5}}{\Delta E_{VD}}$ $\frac{\Delta E_{CE}}{\Delta E_{REL}}$ ΔH $\frac{\delta E_{ord}}{\Delta u_{0.5} Pt_{0.5}}$ $\frac{\Delta E_{VD}}{\Delta E_{CE}}$ $\frac{\Delta E_{REL}}{\Delta H}$ $\frac{\delta E_{ord}}{Ni_{0.5} Au_{0.5}}$ $\frac{\Delta E_{VD}}{\Delta E_{VD}}$ | $ \begin{array}{r} $ | Rendem + 543.6 - 307.0 - 60.5 + 176.1 + 42.3 - 103.5 ~ 0 - 61.2 + 722.2 | $ \begin{array}{r} I \\ + 426.8 \\ - 504.5 \\ - 18.0 \\ - 95.7 \\ - 65.4 \\ + 48.6 \\ + 28.2 \\ ~ 0 \\ + 76.8 \\ + 26.7 \\ + 561.8 \\ 421.2 \\ $ | Bandom + 426.8 - 403.3 - 53.8 - 30.3 - + 48.6 + 1.5 ~ 0 + 50.1 - + 561.8 202.2 |
| $\frac{Ni_{0.5} Pt_{0.5}}{\Delta E_{VD}}$ $\frac{\Delta E_{CE}}{\Delta E_{REL}}$ ΔH $\frac{\delta E_{ord}}{\Delta U_{0.5} Pt_{0.5}}$ $\frac{\Delta E_{VD}}{\Delta E_{CE}}$ $\frac{\Delta E_{REL}}{\Delta H}$ $\frac{\delta E_{ord}}{Ni_{0.5} Au_{0.5}}$ $\frac{\Delta E_{VD}}{\Delta E_{CE}}$ | $ \begin{array}{r} $ | Rendem + 543.6 - 307.0 - 60.5 + 176.1 - + 42.3 - 103.5 ~ 0 - 61.2 - + 722.2 - 283.8 | $ \begin{array}{r} I \\ + 426.8 \\ - 504.5 \\ - 18.0 \\ - 95.7 \\ - 65.4 \\ + 48.6 \\ + 28.2 \\ ~ 0 \\ + 76.8 \\ + 26.7 \\ + 561.8 \\ - 464.8 \\ - 561.8 \\ - 464.8 \\ - 564.8 \\ - 566.8 \\$ | Bandom + 426.8 - 403.3 - 53.8 - 30.3 - + 48.6 + 1.5 ~ 0 + 50.1 - + 561.8 - 369.2 |
| $\frac{Ni_{0.5}Pt_{0.5}}{\Delta E_{VD}}$ $\frac{\Delta E_{CE}}{\Delta E_{REL}}$ $\frac{\Delta H}{\delta E_{ord}}$ $\frac{Au_{0.5}Pt_{0.5}}{\Delta E_{VD}}$ $\frac{\Delta E_{CE}}{\Delta E_{REL}}$ $\frac{\Delta H}{\delta E_{ord}}$ $\frac{Ni_{0.5}Au_{0.5}}{\Delta E_{VD}}$ $\frac{\Delta E_{VD}}{\Delta E_{CE}}$ $\frac{\Delta E_{REL}}{\Delta E_{REL}}$ | $ \begin{array}{r} $ | Rendem + 543.6 - 307.0 - 60.5 + 176.1 - + 42.3 - 103.5 ~ 0 - 61.2 - + 722.2 - 283.8 - 82.5 | $ \begin{array}{r} I \\ + 426.8 \\ - 504.5 \\ - 18.0 \\ - 95.7 \\ - 65.4 \\ + 48.6 \\ + 28.2 \\ ~ 0 \\ + 76.8 \\ + 26.7 \\ + 561.8 \\ - 464.8 \\ - 20.2 \\ \end{array} $ | Bandom + 426.8 - 403.3 - 53.8 - 30.3 - + 48.6 + 1.5 ~ 0 + 50.1 - + 561.8 - 369.2 - 68.3 |
| $\frac{Ni_{0.5}Pt_{0.5}}{\Delta E_{VD}}$ $\frac{\Delta E_{CE}}{\Delta E_{REL}}$ ΔH $\frac{\delta E_{ord}}{\Delta E_{CE}}$ $\frac{\Delta E_{VD}}{\Delta E_{CE}}$ $\frac{\Delta E_{REL}}{\Delta H}$ $\frac{\delta E_{ord}}{Ni_{0.5}Au_{0.5}}$ $\frac{\Delta E_{VD}}{\Delta E_{CE}}$ $\frac{\Delta E_{REL}}{\Delta E_{REL}}$ $\frac{\Delta E_{REL}}{\Delta H}$ | $ \begin{array}{r} $ | $\begin{array}{c} \textbf{Rendom} \\ + 543.6 \\ - 307.0 \\ - 60.5 \\ + 176.1 \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\ $ | $ \begin{array}{r} I \\ + 426.8 \\ - 504.5 \\ - 18.0 \\ - 95.7 \\ - 65.4 \\ + 48.6 \\ + 28.2 \\ ~ 0 \\ + 76.8 \\ + 26.7 \\ \\ + 561.8 \\ - 464.8 \\ - 20.2 \\ + 76.8 \\ \end{array} $ | $\begin{tabular}{ c c c c c } \hline & & & & & & \\ \hline & & & & & & & \\ \hline & & & &$ |

TABLE I. - Contributions of volume deformation (VD), charge exchange (CE), and relaxation (REL) to

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