Low-Ca Olivine phenocrysts in Island Arc Volcano

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Calcium content in olivine phenocrysts of island arc and continental arc ranges from 0.1 to 0.25 wt%. This is systematically lower than Ca content in olivine of submarine basalts (0.2-0.6wt%) and Hawaii tholeiite (0.25-0.4wt%). Feature of low-Ca content resembles mantle olivine. However, the low-Ca olivine in arc basalts and andesites is not xenocryst of mantle olivine, since some low-Ca olivines indicate skeletal growth texture and low-Ni content (less than 0.2 Ni wt%). According to model of Ca partitioning between olivine and liquid, Ca content in the olivines coexisting with basaltic liquid of arc volcano must be nearly 0.4 wt%. Therefore, all olivine phenocrysts in arc basalts and andesites are disequilibrium with liquid and An-rich plagioclase phenocrysts. Little is known about low-Ca olivine in data of phase equilibrium experiments and olivine-liquid partitioning, indicating that low-Ca olivine crystallized from distinctive low-Ca liquid different from liquid line of descent for arc basalts.